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Electrical Matters in Honolulu.

Our Hawaiian correspondent, Col. John Cassidy, sends us the following interesting electrical news from Honolulu, where he is enjoying life with abundant zest. The newspaper which he sends, and from which we get the information, is named the *Paradise of the Pacific*, and discourses on electrical matters in the most enthusiastic manner. It says:

Honolulu has the cheapest and best system of telephones in the world. There are 1,024 telephones in use, connecting business houses, residences, markets, butchers, bakers, and every town, hamlet and ranch on the island. The system is one to make the United Stateser weep, as he contemplates how far the "savages who killed Captain Cook" have got ahead of him. There is no ringing a bell to attract the central office, waiting for a return ring and then wrestling with central to get a connection you want. You simply pull down a lever and say your say without more ado. The telephone company owns the telephone, puts it in, wires the house and keeps everything in repair all for $5 a quarter for residences and $9 a quarter for business houses. There are no extras and no charges for making connections out of town. Moreover there has been evolved a wonder of the Nineteenth Century, viz: an attentive and obliging "Central." Does the clock run down—"Central what time is it?" Does the fire bell ring—"Central where's the fire?" Does a steamer's whistle blow—"Central what steamer is that?" "Central how far off is the steamer?" and the answer always comes quick and cheerful. Do you forget to order your breakfast steak until the butcher has gone home for the night, tell "Central" what you want and he will order it for you early the next morning. Do you want to be called at four o'clock in the morning, or when a certain steamer comes in sight, or know what the latest election returns are, pin you faith on "Central" and he will land you right side up with care every time. So much for telephones. Can any driving Yankee town or mushroom California production of like size beat it?

Honolulu has a street electric arc light system, consisting of 58 2,000-candle power lights, and is putting in 60 more. There is also now being put in a plant of 2,000 16-candle power incandescent lamps for house lighting. The Thomson-Houston arc and incandescent dynamo are used. Both are owned by the government, and are run by water power, supplied by water from the city system, which on its way to town runs through a turbine wheel, and then back into the main again.

Is there a town in Nebraska or Kansas of 20,000 inhabitants, which has shown any more enterprise in the supply of light? If so we wish to invite them around to a poi supper with cold boiled baby a la taro patch fiddle.

Honolulu has 69 miles of streets and roads, 14 of which are well macadamized with crushed volcanic and coral rock.

Hypnotized by the Phonograph.

Dr. Pinel, of Paris, is said to have succeeded in hypnotizing several subjects by means of the phonograph. All the commands given through this channel were, he declares, as readily obeyed as those which he had uttered directly, and "suggestions" of every possible sort were as effectually communicated through the medium of the machine as if made *viva voce*. The conclusion which he deduces from his experiments is that the received theory of a magnetic current passing from the operator to the subject is entirely baseless, and that the real cause of the phenomenon of hypnotism is nervous derangement on the part of those subject to them.

A Design for a Standard of Electrical Resistance.

The two chief points to be borne in mind in designing a standard of resistance, says the *Philosophical Magazine*, are the material and the form of the instrument. Mercury, though it can be obtained and kept in a state of purity, is yet, for many obvious reasons, rather an inconvenient substance for a standard of resistance; it is better to use a wire of platinum silver alloy, the permanence of which may be fairly anticipated from previous experience.

The ordinary B. A. form of resistance is too well known to need description; but some of its disadvantages may be alluded to. Owing to its size and shape, it requires some time for the wire to take up the temperature of the liquid in which it is immersed; and the heat produced by the passage of the current will not be easily got rid of. The old form also cannot be entirely immersed, as by so doing the water will short-circuit the two stout rods which form the terminal connections; hence the bottom of the coil may be at one temperature while the top is at a different one. If the resistances are used at the temperature of melting ice, dew will be deposited on the surface of the paraffin wax, and will thus tend to short-circuit the resistance.

The improved form designed by the author consists of a flat ring, with an interior rectangular channel in which the silk-covered wire is wound double. The connections are by means of two stout copper rods soldered to the two ends of the coil. These rods rise up inside two brass tubes, from which they are insulated by ebonite rings. The bottom rings are plain washers; the two top rings are hollowed out funnel shape; into these two funnels paraffin oil can be poured, thus effectually preventing any creeping of moisture. In constructing such a coil, the wire is at first cut off a little too long; after the copper connecting rods have been soldered on, the resistance is measured; to reduce it to the standard, the silk covering is removed carefully at the bend where the wire is doubled on itself; the bared loop is then twisted together until exact adjustment is almost obtained; the twisted coil is then touched with solder, and the bared portion is re-insulated with silk.

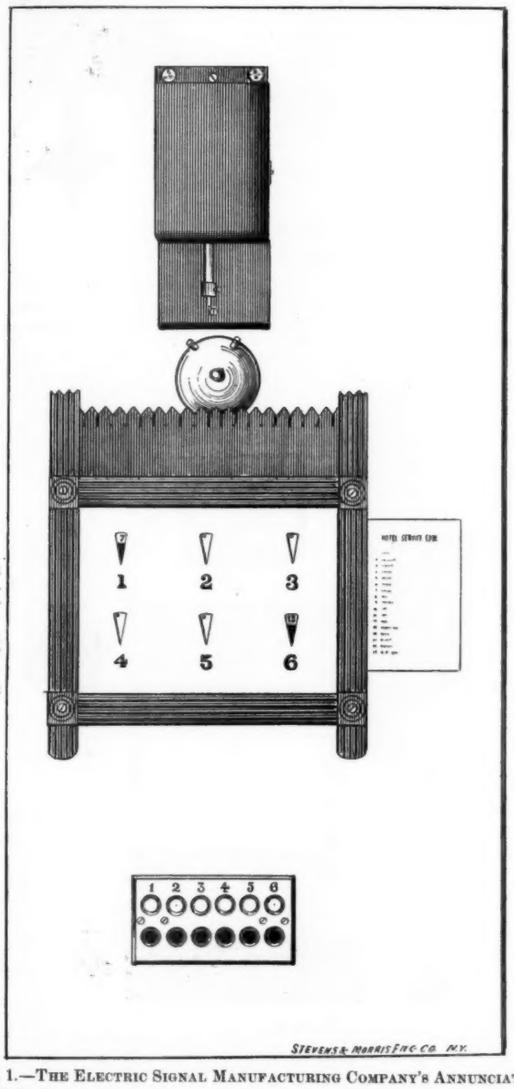

FIG. 1.—THE ELECTRIC SIGNAL MANUFACTURING COMPANY'S ANNUNCIATOR.

A New and Valuable Electric Signaling System.

The Electric Signal Manufacturing Company, of New York, has acquired, by purchase and assignment, a number of patents granted by the United States, covering important inventions in electric signal service. It will been seen from the illustrations that these patents cover something entirely new both in construction and application. The simple and durable apparatus and effective methods employed certainly secures pronounced advantages. With the exception of the telephone and telegraph, but little practical work has been devised for the transmission of any number of arbitrary signals from the same apparatus. In nearly all previous attempts to attain better results in signaling apparatus, the old style of instruments have been selected as the foundation, and additions and alterations have been added until the result became too complicated for practical use. The principal uses to which the inventions owned by this company will be applied, are the police service for cities; the fire service, both direct and auxiliary; the hotel service, public buildings, etc.

The annunciator or receiving instrument (see Fig 1) is claimed to be different from all others in the fact that in every single transmission it not only shows the number of the room or calling station, but also shows the "want" selected at the calling station, as for example, in the hotel apparatus the annunciator would show the number of the room calling and also indicate "ice-water," "porter," "messenger," or whatever the guest might require. In exterior appearance it is not unlike the ordinary form, requiring about the same amount of wall space. The mechanism is extremely simple and contains no needles, shutters, or delicately adjusted springs, as in the common form; and none but the hardiest principles of mechanics, which are well calculated to stand the roughest usage, are embodied in it. There are fewer working parts than in others, and therefore the instrument is much less liable to fail in operation from this cause alone.

The system is absolutely non-interfering, and any number of different calls can be sent in while other calls are returned to zero, without complication.

The outlaying stations or rooms (see Fig. 2) are provided with a small call-box containing a dial and pointer, not much different in appearance to a small circular clock. On the face of the dial are engraved the wants, numbering from two up to any number desired that could be of any practical use.

In operation, the pointer on the dial of the call-box is set to the required want, and by pulling down a lever below the box the mechanism is released and the signal reproduced at the office or central station, a small bell announcing the incoming message. The clerk or operator can then notify the calling station that the message has been received, by pressing a button which rings a bell in the room.

The circuit employed is the same that is now used with the ordinary push button, and the instruments can be installed in any house that is now wired for the old systems with but a few hours interruption of the service.

In Fig. 3 is shown the receiving apparatus for the police system, and Fig. 4 shows the outlying station or patrolman's box. Fig. 5 is a diagram showing the location of flash

lamps in a district of nine blocks, so situated that the patrolman is in constant view of one of them. The object is to send out arbitrary signals from the central stations to sub-stations or any number of individual boxes, and to send back from any of these sub-stations similar arbitrary signals, to have messages going and coming at the same time and to send such signals by night or day.

The value of the flash light cannot be overestimated, as it affords the sergeant in the central station means of communicating with any or every patrolman out on duty, the signals being transmitted at once to as many points on the line as may be desired. Say it is desired to tell a certain policeman to do something represented by the number 5. The sergeant turns the hand of the repeater (above the annunciator in Fig. 3) to the number and then switches on the box or boxes he wishes to call by means of the switch (shown below the annunciator), and the lamps over the policeman's beat will flash five times. This goes on indefinitely and automatically at intervals of ten seconds until the policeman sees it, stops it, and signals back that the order has been received. The automatic repetition of the audible and visual signals is a peculiarity of this system. The number of boxes or sub-stations to which it can be applied is unlimited.

The apparatus, with slight variations, is used as a fire signal system with a view of placing instruments in public buildings and private houses so that the householders are placed in direct communication with the fire department as well as providing a city or town with the usual street boxes.

The system also includes messenger boxes for district telegraph purposes, together with a new 17 call-box with a return signal bell, which is a most important feature in suburban localities.

Where it is desirable to use closed circuits the register may be substituted for the annunciator as in district telegraph work, but the company have also closed circuit annunciators for particular service.

For economy of cost, for the retention of signals at the central station where they belong and not at the outlying boxes, for the repetition of signals, for the simultaneous sending and receiving of signals, and above all the simplicity and durability of all apparatus employed, the devices of the Electric Signal Manufacturing Company deserve this special recognition. The offices of this company are located at 45 Broadway, in the new Aldrich Court building, where the system is exhibited in detail.

Electric Railways.

A CHAPTER FROM FRED W. WHIPPLE'S FORTHCOMING PUBLICATION.

Street railroad men should not think that electric railroading is analogous with horse car railroading, for such is not the case.

The higher rates of speed which it is possible to maintain, the greater loads which it is possible to carry, and the additional weight of the motor and running gear, all combine to render necessary additional attention and care, not only in construction of new road but in the maintaining of old road.

Experience, so far, seems to have clearly demonstrated that by far a large majority of the street roads which have been equipped electrically, have been done so with accompanying annoying circumstances. The tracks have spread, sunk and curled up, and, in several cases, complete reconstruction was the only remedy.

It must not, however, be thought that this, in all cases, is absolutely essential.

Throughout the country there has been the past few years a most decided improvement in track construction, and the roads which have been built within the last year or two, no doubt, will stand the additional strains of the electric car.

Experience, however, dictates that no rail of any shape should be used that does not weigh at least 50 pounds per yard. It is also true that the tracks of a street road are subjected to strains which even the steam roads do not have to contend with. The side thrust of heavy vehicles in some instances is tremendous. As a result of the experience of the West End road of Boston, a girder rail weighing 85 pounds per yard is to be laid. Their experience has taught them that it is small economy to save in the construction of their road-bed.

In the management of electric roads, a change will inevitably be brought about. A different class of men will be brought to attend to the details. Without doubt, a more skilled and intelligent class of men will be necessary to maintain the service. I do not predict from this that the expense of operating per car will be greater, since in mechanical work of this nature, the duties of one man can cover far more than in the case of operating with horses.

Outside of the higher offices, experience has shown that the regular horse car drivers and conductors prove the best electric car drivers. Their judgment in regard to handling their car counts far more than mechanical experience on the part of others. What little mechanical skill and electrical knowledge is necessary to simply operate the car, the ordinary, intelligent horse car driver soon masters. It is, however, true that he must exercise better judgment, give more attention to the handling of his car in looking out for pedestrians and vehicles, and in many other directions exercise caution and control over himself.

In the maintenance of the cars, naturally more skilled labor is required, and here the saving of a few dollars in wages would result disastrously. Intelligence is the prime factor, and this can only be obtained by paying for it.

The superintendents, and even the managers, of electric roads, must of necessity become familiar with the details of their system, and 101 small rules and details which they have mastered in the handling of their horse car system will have to be thrown aside and be supplanted by new ones attained by thought and study of the new system.

In many cases, no doubt, good horse car superintendents will lose their situations, but in the general march of progress disaster is inevitably to come to some.

Throughout an entire electric system, it therefore seems that a better class of men will be required. Whether this will have any direct influence upon the labor problems which always harass and bother street car management, I cannot say. I am inclined to think that it would have a beneficial effect.

It seems to-day as if steam railroad practice must be studied to give valuable hints and assistance in the management and operation of the electric street roads. It does not necessarily follow that rules applicable to them are always applicable to street car systems, but a combination rather is what is desired.

The propelling system is mechanical, and yet the locality wherein the system is used is such that many rules governing street car propulsion must still be observed. It is, however, an upward tendency. It is the lifting of the street car business out of the lower ruts of animal power to the higher plane of mechanics.

In the tremendous increase of street car business which the electric system is destined to bring about, no expense, time, labor or care should be saved. The electric railway system of the future is to exert a most powerful influence upon the progress of the nation. In carefully examining statistics and the tendencies of the times, it seems as if the street cars were destined to play the most important part of all other industries in the development of the country.

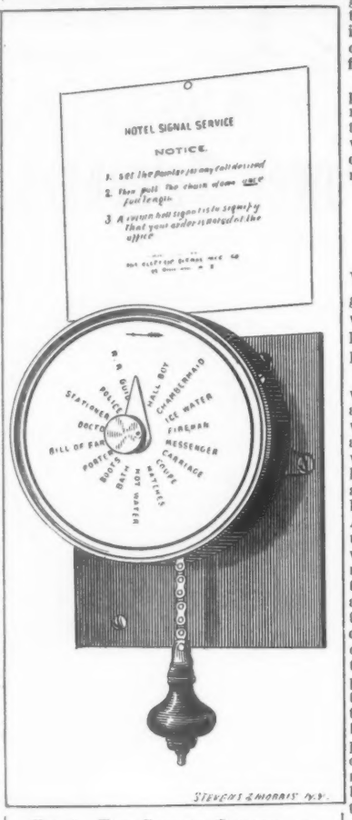

FIG. 2.—THE CALLING STATION, OR ROOM BOX.—(See page 1.)

There are to-day over 40 cities having a population of over 50,000, and the general tendency of the people is toward the cities.

Since it is in the cities that the street car exerts its influence, surely it must be true that in keeping with its gradual tendency must the street car systems be improved. I venture to predict that within the next decade there will be such an extraordinary application of the electric power to the propulsion of street cars that the use of horses will be a rare sight.

In some of the largest and most conservative cities of the Union, an application has already been made by the company controlling the entire system of the city for perfect freedom in operating its cars by the electric current taken from the overhead wire. If the West End Railroad of Boston gets the right, and it certainly looks as if they would, then the largest street railway system of the world will have endorsed the practicability and the perfection of the electric system.

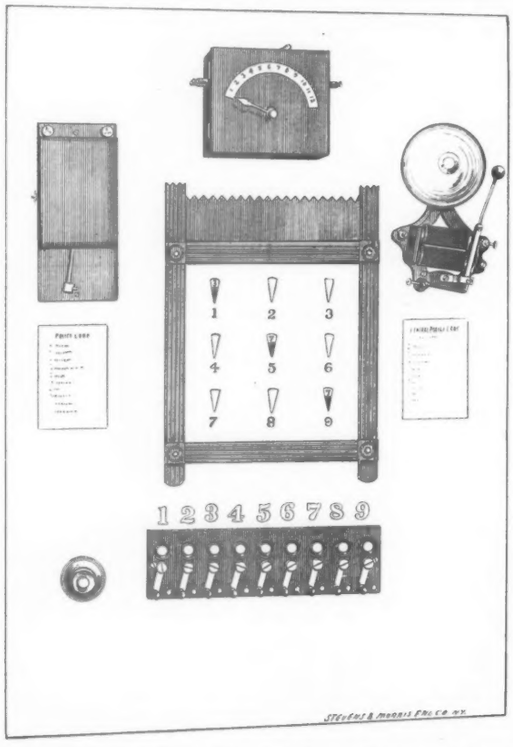

FIG. 3.—THE ELECTRIC SIGNAL MFG. CO.'S POLICE RECEIVING APPARATUS.

Wonderful as have been the achievements of science in the present century, there seems to be nothing which will be comparable with this promised application. The most mysterious force which man has yet brought within his powers is to be applied in a common commercial way in every street of our great cities.

Every man throughout the country engaged in the street railroad business feels the tremendous impulse which this application is giving to his business, and it does not become any party to rashly predict a dismal failure.

In the words of one of America's greatest philosophers, Emerson, "Our duty is plainly not to throw ourselves across the track, not to block improvement, not to sit still until we are stone, but to watch the uprise of successive mornings and to conspire with the new works of new days."

"The Waste of Competition."

Under the above heading Mr. Erastus Wiman, the well-known financier, and a gentleman well known in electrical circles, where he has large interests, has issued what he calls a "skit," in which appear the following striking sentiments:

Does any one suppose that petroleum would be as cheap as it is to-day if the Standard Oil Company had not existed? This vast monopoly has been most persistently abused, but it has done more to help the world toward a cheap and safe artificial light, and thus done more for mankind than all the contributions of its detractors combined. The early and wide distribution of American petroleum throughout the civilized universe, the perfect safety of an article which in less careful hands might have been most dangerous, the infinite variety of uses to which its product has been devoted, and above all, their cheapness, are testimonies to the beneficial success of the greatest of combinations in one of the chiefest essentials of existence. In the matter of transportation of petroleum through the facility of pipe lines, conveying by the law of gravity the raw material from the point of production to the point of manufacture and distribution, a saving has been effected of stupendous proportions for the eventual benefit of the public. Far more has, in this new mode of freighting, been achieved by combination than was ever possible to competition. For the expenditure of the 30,000,000 necessary to provide these pipe lines would have been out of the range of possibilities for a score of competitors. The more the competitors, the less the likelihood of such a beneficent result.

But not alone in petroleum are the benefits of combination in the matter of price and quality seen. The range of advantage is surprisingly large, as admirably shown in a series of striking comparisons by my friend Mr. Frank B. Thurber, before the State Senate Committee on Trusts, and more fully amplified in his philosophic speech before the Merchants' Association at their recent banquet in Boston. The position of Mr. Thurber on this matter of industrial combinations, is a most significant indication of the oscillation of the pendulum of thought on this subject. He was the spirited and successful leader of the anti-monopoly movement in the Empire State, and was then just as sincere as he is now in his thoughtful and intelligent appreciation of the necessities of combination for the good of the people, as for those more directly concerned.

No one should belittle the dangers of monopoly. But it is just as unwise to forget the evils of rampant and unsafe competition. What is the remedy as between the two evils? Perhaps some mode of safely providing for about one-third of the community would meet the bill. It would certainly pay two-thirds of the traders of the land to board and lodge the remaining one-third, if they would simply get out of business and cease to annoy and impoverish by expensive competition. If one-third of the railways, one-third of the manufacturers and one-third of the stores and offices were to cease to do business to-morrow, the other two-thirds could better afford to keep the parties concerned at the best hotels in the land, and let them go to the theatre every night, than to stand the terrible expense which undue and injudicious competition now creates. In the end the public pay for all these extraordinary expenses incident to competition. One way or another the obligations must be met. Failure, loss and disaster may come and do come to individuals in the meantime; but in the great balancing up of a series of years the accounts are all squared in the clearing house of the purse of the public. It must be so, or business would come to a standstill; but meantime, is it not a problem that calls for reform, this unlicensed, expensive and disastrous saturnalia of competition?

It would not be surprising if the writer of these lines should be metaphorically hung, drawn and quartered for presuming to crowd so much heresy into a space so short; but he will have the gratification of knowing that not a few thinking men agree with him in thus giving expression to what in the minds of a vast number of people must be a latent thought.

A Universal Dead-Beat Galvanometer.

The instrument, which was specially designed for physiological researches, is generally similar to Weidemann's form of tangent galvanometer; by an easy alteration it can be made suitable for ballistic measurements.

On a base of wood is fixed a graduated bar, set on edge. The base rests on three feet, two of which are levelling screws, the line joining them being perpendicular to the bar, so that the galvanometer can be at once set up in position by placing these two screws in the line of the magnetic meridian. On the bar slide two slotted pieces, each of which carries a coil of wire; these can be readily exchanged for others, according to the nature of the measurements to be made. The wooden cores on which the coils are wound are hollow out on one side into semi-spherical cavities.

From the base rise two columns, right and left of the bar, carrying a cross-piece on which rests the closed cylindrical box containing the magnet, mirror, and damping arrangements; this case is capable of being rotated as a whole in the hole in the cross-piece, in which it rests. The rod carrying the mirror and magnet is suspended by a fibre passing through a tube fixed on the top of the box; the magnet is at the lower end of the rod, and is shaped like a horse-shoe. The rod passes down through a tube forming a prolongation of the box, and having a screw thread cut on its lower end, so that dampers of copper and brass, and of various forms, may be screwed on, enclosing the magnet. The suspension tube carries a directing magnet; if this be removed, the instrument becomes a simple tangent galvanometer. The galvanometer can be rendered astatic by placing a second horse-shoe magnet just under the mirror, on the rod carrying the latter and the lower magnet. Or the whole magnetic system may be replaced by an ordinary mirror with small magnets, as in Thomson's usual form. The readings may be taken either with a spot of light or with a telescope.

Storage Batteries for Yachts.

The storage battery is constantly extending its field of usefulness. The following latest advices from the Gibson storage battery are of interest:

Letter from the chief engineer of Gen. Brown's yacht "Ballymena," dated St. Augustine, Fla., April 23d, 1889: "It gives me pleasure to say that your battery is improving all the time. In proof of this I will say that I have not charged it since the 8th of this month, and still have enough on hand for several nights; of course we have not used all the lights, but have used from four to six lamps until ten o'clock every night during that time. The battery is certainly the best one for yachts ever in use. We have had some very rough weather on our last cruise, and it never failed to work, even when it was impossible to get lights from the dynamo. Another good feature is, no matter how much we roll, we have never spilled any of the acid, which has been the trouble with several yachts we have met on our cruise. Mr. Brown has spoken very highly of your battery to several yacht-owners. I examined the cells two weeks ago, and put about one gill of water in each cell."

Letter from engineer in charge in New Orleans, dated April 21st, 1889: "The car was run all day, making 57 miles 120 stops, and to-day being Sunday, we had more or less passengers aboard. We carried almost all of the stockholders of the Horse Car Co., and they one and all want electricity."

The battery in Gen. Brown's yacht has been in use for several months, with no attention from the Gibson Co. since it was installed.

The battery in New Orleans is operated on a street car with the most flattering results. The run of 57 miles mentioned was made on a single charge.

* * The chamber of commerce of Wheeling, W. Va., was recently entertained by a lecture on the electric motor and its uses and applications, by Mr. H. C. Spaulding, manager of the motor department of the Thomson-Houston Company.

Chicago, Ill.—The Franklin Electric Company, Chicago; capital, $5,000; incorporators, E. E. Flora, Philo R. Hoy, Edward J. Tooze.

Milwaukee, Wis.—Wisconsin Electric Company, of Milwaukee; capital stock, $10,000; incorporators, Thos. R. Mercein, Bradley G. Schley and H. F. Boggis.

Chicago, Ill.—The Chicago Matrix Machine Company at Chicago; capital, $1,000; to manufacture matrix-making machines; incorporators, R. B. Springer, G. W. Brinkerhoff and P. H. Gunckel.

Pana, Ill.—Pana Electric Light Company, at Pana; capital stock, $10,000; to construct and operate an electric light plant; incorporators, A. B. Corman, L. Schlierbach, Robert Johns, William H. Newcomb, and George V. Purcell.

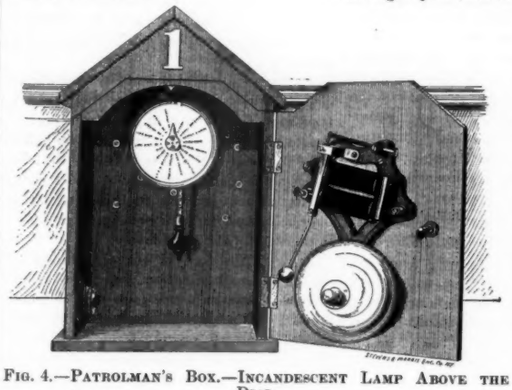

FIG. 4.—PATROLMAN'S BOX.—INCANDESCENT LAMP ABOVE THE DIAL.

Rutland, Vt.—The Marble City Electric Light Company; for the purpose of lighting buildings and the streets of the village. The capital stock of the company is $50,000, divided into 2,000 shares of $25 each. The incorporators are C. Parmenter, Charles A. Gale, W. B. Thrall.

Chicago, Ill.—The Illinois Anglo-American Storage Battery Company, Chicago; capital, $500,000; to manufacture batteries, electric motors, illuminating apparatus for vehicles and buildings for supplying electric power, manufactories, implements and supplies; incorporators, J. B. Long. A. C. Boles, Lewis Shissler.

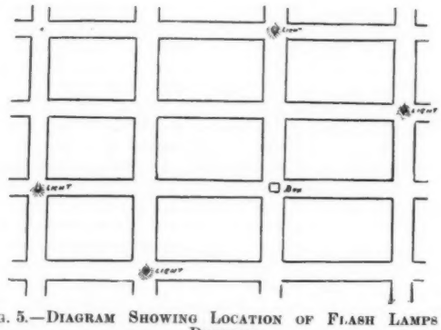

FIG. 5.—DIAGRAM SHOWING LOCATION OF FLASH LAMPS IN DISTRICT.

Wilmington, Del.—The Griggs Electric Air Signal Company, recently authorized by the legislature with a capital stock of $100,000 and the privilege to increase the same to $1,000,000, is organized by electing the following board of directors: A. C. Griggs, General James H. Wilson, Colonel H. A. DuPont, S. N. Trump, Horace Gause, A. S. Elliott, Huxley Harvey. The board elected the following officers: President, General James H. Wilson; vice-president, Horace Gause; secretary and treasurer, A. S. Elliott; general manager, A. C. Griggs; superintendent, Howard L. Pile.

* * The Massachusetts street railway committee recently gave a hearing on the petition of A. L. Huntingdon and others, for incorporation as the Salem and Peabody Electric Street Railway Company, the road to be built according to the plans, methods and inventions of John A. Enos, whereby the cars are suspended from an overhead girder upon which wheels run.

Chicago, Ill.—A certificate to record the increase of the capital stock of the Sun Electric Light Company of Chicago to $250,000 has been filed.

Milwaukee, Wis—The Keelyn Electrical Company, of Milwaukee, capital, $1,000; incorporators, James E. Keelyn, Edward Fitch and William D. Van Dyke.

Harrodsburg, Ky.—The Harrodsburg Electric Light and Power Company has been incorporated by Geo. Bohon, Robert C. Nuckols, L. D. Cardwell and others for electric lighting purposes. Capital stock, $25,000.

Lynchburg, Va.—Dr. E. H. Murrell, of Washington, D. C., representing the Bowen Electric and Traction Company, is endeavoring to organize a company to build an electric light plant, electric street railway and telegraph and telephone lines.

Abingdon, Va.—The Abingdon Water Works Company has been chartered with T. P. Trigg, president, to build and operate an electric light plant and water and gas works. The capital stock is not to be less than $20,000 nor more than $100,000.

San Francisco, Cal.—The Keith Electric Company has been incorporated, with Montgomery Godley, Nicholas T. Romaine, George W. Osborn, James R. Pickens and Sidney M. Smith as directors. Capital stock, $1,000,000, divided into 10,000 shares.

Seneca, Kansas.—The Seneca Electric Light and Power Company, of Seneca, Kan., incorporated for the purpose of generating and supplying electricity for electric light and power. Capital stock, $30,000. Directors: Milton B. Smyth, S. K. Linscott, Sidney Hayden, John Q. Myers, of Holton, and C. E. Pemick, of Topeka

Kansas City, Mo.—The Reed Springs and Kansas City Railroad Company; purpose of constructing and operating railroad from the Hannibal and St. Joseph, Chicago, Milwaukee and St. Paul and Wabash Western depots to Reed Springs; the capital stock of the company is $40,000, divided into 400 shares; the directors are G. J. Reed, J. D. Swan, W. N. Ewing, Samuel Hardwicke, George P. Swan, J. A. Hayes and M. C. Nixon; the line will be operated by steam, electrical or other force that may be decided upon.

Kansas City, Mo.—Robert Gillham, M. C. Gillham, E. R. Gill and W. W. Alexander incorporated the Gillham-Alexander Electric Manufacturing Company with a capital stock of $300,000. The company is organized for the purpose of manufacturing electrical apparatus under patents granted W. W. Alexander, consisting of automatic electric railway signals and switches, automatic electric light switches, electric mechanical locks, automatic electric fire and police patrol signals, submarine and surface torpedo system, silent telegraph apparatus, etc. The capital stock is fully paid up. Of the $300,000 one-sixth, or $50,000, is in cash and the balance, or $250,000, represents the value of the patents. Robert Gillham is president, W. W. Alexander, vice-president; M. C. Gillham, secretary and treasurer; and E. R. Gill, superintendent.

Bryan, O.—The Fountain City Electric Light Company, of Bryan, Ohio, capital stock, $30,000.

Camden, N. J.—The Self-Storage Electric Light and Power Company has filed articles for the increase of the capital stock to $600,000.

Natick, Mass.—The Natick Electric Company, of Natick; capital stock, $40,000; David F. Fisk, president; H. W. True, treasurer; the same and H. H. Whitney, directors.

San Francisco, Cal.—The Keith Electrical Company; capital stock, $10,000; directors, Montgomery Nicholas, T. Romaine, George W. Osborn, James R. Pickens and Sidney M. Smith.

Chicago, Ill—Winn Boiler Compound and Manufacturing Company; capital, $100,000; to manufacture boiler compounds, lubricating oils, and sell engineer's supplies; incorporators, R. B. Bailey, D. R. Booger, James Kincade.

Chicago, Ill—The Osborne Steam Heating Company, at Chicago; capital stock, $20,000; to manufacture and operate appliances for heating, power, lighting and other purposes; incorporators, Jesse Cox, Gideon F. Lanaghen and Eugene F. Osborne.

Chicago, Ill.—The Turner Brass Works at Chicago; capital stock, $7,000; for the manufacture of specialties in brass, German silver and iron, and for plating and the manufacture of castings; incorporators, E. S. Turner, G. McNellis and W. D. Washburn.

Fall River, Mass.—A corporation to be known as the Carr Metal Company is being formed at Fall River, with a capital stock of $50,000, to manufacture an alloy of zinc and mercury for battery purposes. The company will begin operations at once. They have already received orders amounting to several thousand dollars.

Spokane Falls, W. T.—The Washington and Idaho Telegraph Company has incorporated. The line will run from Hope, Idaho, through the Chloride mining district, taking in Iceville, Gray's Landing, Marshall, Webber and Chloride. They expect to be open for business by April 22. Capital stock, $50,000. The officers and owners are John Stone, J. H. R. Allen and E. B. Spencer

Bar Harbor, Me—The Consolidated Electrical Association of Maine has been organized for the purpose of doing general electrical business all over the State. The association succeeded to the business of the Electrical Accumulator Company. The office is in the Mount Desert Block, Bar Harbor, and its officers are as follows: President, George H. Grant; treasurer, H. W. Ladd; electrician and manager, Luther A. Leach.

New York.—The certificate of incorporation of the Edison General Electric Company was filed in the county clerk's office April 24th. Its objects are to manufacture, purchase, and sell electrical machinery. The capital is $12,000,000, and the company paid the State as a tax $15,000, probably the largest amount ever paid for this purpose. The company's term of existence is 50 years, and its principal office will be in New York City. There are to be branches in Schenectady, Albany, Brooklyn, Buffalo and other cities. The trustees are Joseph S. Decker, W. A. Williams, Edward Edes, William S. Perry, Otto Lowengard, Henry E. Lord, C. A. Spofford, Leonard R. Kidder, Henry N. Curtis, and Cornelius E. Eckerson, of this city, and James B. Williams, of Stamford, Conn.

ELECTRICAL REVIEW

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, MAY 11, 1889.

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It looks as if the price of copper would have to come down.

New York City is having light again for a period of ten days. Why not for ten years, if for ten days?

Our esteemed contemporary the *Electrical Engineer* of London, calls attention to the fact that the importation of American electric light apparatus "continues to increase in rapidity and importance." Not such a bad thing from an American standpoint.

The first thing our far-seeing Board of Electrical Control did after cutting down the electric light wires was to order them back again!

There are rumors afloat of a new alternating current motor which requires but one circuit and starts under load. Well, well, what next?

The underground question is being discussed in England with a ponderosity which if it lacks something of the spice of the controversy in the American press still should bring forth good fruit.

One of the new electric industries which it is claimed will make a good showing at the Paris Exposition is tanning by electricity. Not only is the operation performed in one-thirtieth of the time previously required, but the quality of the leather is said to be also improved.

The next regular meeting of the Electric Club (Thursday evening, May 23d) will be addressed by Mr. Erastus Wiman, of this city, one of the leading members of the Club, a gentleman who takes a lively interest in progressive electrical work. Mr. Wiman's topic is entitled "Electrical Possibilities as Viewed by a Business Man," and the members of the Club are assured of an intellectual and highly interesting and valuable address.

Messrs. Frank F. Lovell & Co., of this city, have in press, and will issue about May 18, a little book of about 150 pages, entitled "A. B. C. of Electricity," by Wm. H. Meadowcroft. This work has for its object the explanation in simple language of the general outline of electrical science, including electric light and power, and is designed for the instruction of young people and the general public who do not understand the technicalities of electrical matters.

Our valued contemporary, *The Electrician*, London, refers to the reason why American exhibits at the Paris Exposition will make a good showing as "an extravagant preference which appears to have been shown to rival exhibits from the other side of the Atlantic." We are inclined to differ on that point, and attribute the size and undoubted excellence of the American exhibits to the push and enterprise which has taken proper advantage of the opportunities offered.

The telephone amalgamation in England, of which we made recent mention, has received a severe check through the refusal of the Postmaster General to consent to the plan. It seems that the English Government still entertains the idea that some day it may wish to buy up the telephone systems, and therefore it does not care to grant any privileges which may enhance their value. This policy is one that can scarcely receive approval on this side of the water.

A new application of the phonograph is going to worry the physicians who make specialties of coughs, heart beating, etc. As all coughs have some distinctive features, as "barking," "dry," "moist," "hacking," etc., these may be recorded on the instrument. The physician prescribes, and immediately after his departure the remedy or number of the prescription is confided to the instrument, which thus becomes a combined manual and family doctor—illustrated. The baby sneezes in it, the doctor prescribes. Next time baby sneezes mamma turns to the instrument and turns out the remedy. There's millions in it! and each year it will become more and more valuable through its stored up yet readily reached information.

DECISION IN RELATION TO THE TERM "MANUFACTURE."

At Harrisburg, Pa., Judge Simonton, in an opinion handed down, May 6, decides that the Western Union Telegraph Company has no right to remove its case to the Circuit Court of the United States. He holds that the suit is brought to enforce a forfeiture for the violation of State laws; it is not a suit of a civil nature. He therefore retains jurisdiction of the case. In the case of the electric light companies, Judge Simonton decides they are not manufacturing corporations, and therefore are not exempt from taxation. He holds that the term "manufacturing" cannot properly be applied to any corporation which does not produce material substances. He says electricity is not a material substance, neither is the electric light a material substance. In this opinion Judge Simonton declares that the act of 1879, imposing a tax upon capital stock, is constitutional.

THE PLACE OF ELECTRICITY AMONG THE INDUSTRIES OF THE WORLD.

In this busy age of ours it is not often that men stop in the eager pursuit of gain to calmly gaze at the state of the industry in which they are engaged, nor to speculate upon its claim to a given place among the important vocations of mankind; yet to do so is not without profit.

The application of electricity to the wants of man has gained a prominence never before equalled by any agency, for rapidity of growth and for amount of capital invested, because of the simple reason that at last it has enabled man to do that for which he has been striving ever since the world began; namely, to do work, without loss of time, at a distance from the place where energy is expended. The success of the telegraph, the submarine cable, the telephone, the electric light and the electric motor depends alone upon the practical annihilation of time and space.

The earlier applications of electricity have already reached a point where their growth from month to month or even from year to year is not more striking than in some other large industries; the same is true of the telephone and the submarine cable, and no surprising rate of growth in these industries may be looked for until some great advance in the state of the art is made.

Not so, however, in the application of electricity to illumination and transmission of power; two industries, one of which had its birth just prior to the present decade, and the other (electric power) a few years later. The electric light, foreshadowed at the beginning of the present century, and the electric motor, about a generation later, began to attract attention in industrial circles about 1879. The growth of these two industries since that time, hampered alike by conservatism and ill-founded enthusiasm, has been the marvel of industrial progress.

From the year 1880, the number of central stations and isolated plants doubled regularly every year until 1885, when there was a falling off caused by the fact that the more easily acquired business had been secured. This diminution in the number of new plants put in operation continued steadily, and during the year 1888 the increase in the number of plants was only slightly more than 50 per cent. of the total number prior to that time. During the last half of that year the increase was less than 15 per cent. From statistics compiled so far this year, it is probable that the increase during the year 1889 will not be over ten per cent. of the total number prior to that time.

This falling off is by no means indicative of a decrease in the growth of the industry. The territory pre-empted by early companies is steadily filling up with new apparatus and lamps at a rate far in excess of the number of new companies formed. No reliable figures can be obtained at the present writing to show what is the ratio between the growth of the electric light, measured in machine capacity, and in station increase. From data we have collected on this subject, we are led to believe that the true growth of 1889 will be not far from 25 per cent., and that the nearly 6,000 central stations and isolated plants in this country will be increased in number not far from ten per cent. during the current year.

The department of electric distribution of power is a more difficult subject on which to make figures. The fact that there are very few purely electric power stations in this country makes it almost impossible to collect data as to the aggregate horse power of the stationary electro-motors now in use. The department of electric street car propulsion is one in regard to which we have definite knowledge. At the beginning of the present year there were no less than 53 street railways in operation using electricity exclusively as a motive power, and having an aggregate of about 300 miles of single track, and having nearly 400 motor cars. Nearly the same number of miles of track and cars were under process of construction at that time, and it is probable that the close of the present year will see the electric street railway industry more than doubled.

The size of the industry may be summarized in the following figures: There are at present 6,000 central stations and isolated plants using 245,000 arc lamps and 2,700,000 incandescent lamps, and having 500,000 horse-power engine capacity; and the 400 electric railways have a motor capacity of 11,000 horse-power.

The increase of these industries together with electric welding, the electric transmission of handwriting and many other inventions that are rapidly claiming public attention, are bringing into prominence subjects such as the legal rights and relations of service companies and their relations to insurance interests, which were not even thought of a few years ago. The necessity of organization for the purpose of discussing these questions as well as technical subjects, has swelled the ranks of such bodies as The National Electric Light Association, the Edison Electric Light Association and the American Society of Electrical Engineers, all three of which institutions are showing great prosperity. The Electric Club of New York has not only furnished the social ground on which the electrical fraternity of the metropolis meets, but has started the movement which has resulted in electric clubs in all the large cities of the country. Electrical questions are constantly being discussed in the transactions of such organizations as the Franklin Institute, the American Society for the Advancement of Science, the Society of Arts, Boston, the American Societies of Civil, Mechanical and Mining Engineers. The application of electricity in some form or other is one of the foremost questions in the minds of the engineering fraternity.

THE ELECTRICAL FRAUD—WHO YET FINDS MANY BELIEVERS

The schemes of electrical swindlers are numerous, but the primary battery business numbers among its victims perhaps more dupes than any of the others.

When a schemer talks to one who doesn't know an ohm from an electrical contact, the poor bewildered listener is made to believe that just as much energy can be developed with an ounce of acid and a pound of zinc as can be manifested by consuming half a ton of coal, and that the lamp he is looking at is really a much more brilliant light than one produced by steam and dynamo power, which we know as a 16 candle lamp.

One startling statement the schemer makes is that he can produce the light in every house at the same price as is paid now for gas—but he has no time to put up an installation. He puts up the talk, and the dupe puts up the money, receiving one share of stock for each dollar he comes to the center with.

A REVIEW contributor ran across one of these representative electrical fakirs in Chicago recently, and what he learned is given for the benefit and amusement of our readers.

The interviewer was told by the assistant, in the absence of the principal, that the inventor would size up the questioner's gas bill for a year, put as many electric lights in as there were burners, and charge the amount of his gas bill, payable weekly, without costing the consumer one cent for construction.

"Please take my order. When can you have them in?"

And this Gammon, of the firm of Quirk, Gammon & Snap, was good enough to inform the querist that the firm had already 5,000 orders on hand now, and the date would be indefinite; but the stock was booming, and if the party desired any stock now was the time to buy, because to-morrow it would be advanced to $1.50 per share.

And although, in answer to the desire of the investigator to be referred to a living plant, the dear philanthropist informed him, that "We have so many orders from large business houses that we have not been able to get to work on residences," and as he could not remember any of these "large business houses," he mentioned a plant in a hotel which upon further investigation proved to have been run a little, is not running now and will not run again.

References were given to the "large stores" of two merchants whose places of business are not found in the Chicago City directory. It is needless to say that this schemer does not require the assistance of experts, except so far as they take stock in the capital of the company, which is half a million of dollars for an equal number of shares.

ELECTRICAL NEWS.

At Boston, Chicago, Washington and Other Points.

OUR BOSTON LETTER.

Dining with the Beacon Society.—At the regular monthly dinner of the Beacon Society, given at Parker's on Saturday evening, April 27th, there were present as guests, Mr. F. S. Hastings, of New York, treasurer of the Edison Electric Light Co.; Mr. C. A. Coffin, vice-president of the Thomson-Houston Electric Co.; Mr. W. J. Jenks, electrician of the Edison Co.; Mr. C. L. Edgar, general superintendent of the Edison Co., and many gentlemen prominent in law, politics and business. Mr. Charles A. Coffin was the first speaker and held the closest attention during an interesting address, in which the various modern applications of electricity were touched upon. Mr. W. J. Jenks was the next speaker, and gave some valuable facts and figures deduced from his experience with the Edison Co.; Mr. C. L. Edgar followed with some statements as to the development of the electrical business, and invited all present to visit the local Edison station. Mr. W. W. Gooch, counsel for the Edison Illuminating Co., made a witty speech, and was followed by Mr. F. S. Hastings, who gave a brief history of electrical invention and discovery from the very beginnings down to the present time. The speakers were listened to with closest attention, and it was evident the members of the Beacon Society appreciated the opportunity of having such interesting addresses by so distinguished speakers.

Overhead System Allowed.—The aldermen at their meeting on Wednesday, as a committee of the whole, reported an order, which was adopted, granting permission to the West End R. R. to establish, construct, maintain and use the overhead single trolley system of motive power in the operation of its cars in the streets and squares where its tracks are now located and to make such surface and underground alterations as may be necessary. The order also provides that all work of construction, the kind and quality of material used and the height of poles shall be satisfactory to the superintendent of streets and committee on paving. The poles shall be cylindrical in shape and painted before erected, and shall be removed on order of the Board of Aldermen on 60 days' notice. No poles shall be erected until a plan showing their proposed location has been filed by the company in the office of the superintendent of streets and approved by the committee on paving. The order shall be null and void unless the same be accepted by the West End R. R. Company within 30 days of its passage.

Before the Providence Commercial Club.—"Electricity as a Motive Power" was discussed at the last meeting of the Commercial Club of Providence, and among the speakers were Dr. Louis Duncan, Captain Eugene Griffin and Mr. William Bracken.

The Hoosac Tunnel Lights.—Probably no other installation of electric lights in the country has been attended with such difficulties as that put into the Hoosac Tunnel by the Westinghouse Company. Not only were dampness and complicated conditions of the atmosphere to be dealt with, but also the mechanical difficulties, from the very nature of the conditions and the frequent passage of both express and freight trains, were to be overcome. Since the completion of the plant, which was installed by the Thomas Marr Construction Company, Mr. Edward Davis, electrician for the company, has been engaged in improving it here and there and overcoming obstacles, until now it is satisfactorily lighted its entire length, and passengers can clearly see the construction work.

Short Locals of Interest.—Messrs. Spaulding & Buck have installed during the past week a 50 light plant at the Temple Hotel on Washington street, using the Continental dynamo, for which they are the New England agents. They have also put in a small Edison plant for Charles Wyman on Water street, and sold a two horse-power Eddy motor to the Kendall Newspaper Company, of Manchester, N. H. Mr. H. C. Spaulding, the genial and popular manager of the Thomson-Houston stationary motor department, entertained the West Newton Book Club with an exhaustive address on electricity, illustrated with apparatus and drawings, on Thursday evening. Messrs. Claflin & Kimball, New England agents of the Mather Company, have just installed a 50 light Mather plant for the Wyman Paper Mills at Westminster, Mass. Messrs Paine & Francis are doing the wiring work for the 125 light Edison plant on the new French cable steamer "Pouver Quertier," and will also install the 1,000 light Edison plant at the new B. & A. railroad station at Springfield, Mass.

Concerning the Overhead Grant.—The legality of the order passed by the Board of Aldermen granting the West End Street Railway Company the right to use the overhead electric system is being considered by the law department of the city. The mayor will probably not sign the order until the law department has given a favorable answer as to its legality. At the meeting of the Common Council Thursday evening, the following resolution was presented by Councilman E. P. Barry, of Ward 15:

Resolved, That the Common Council deem that the action of the Board of Aldermen in granting exclusive rights to the West End railroad in the construction of the overhead system of electric wires for railways in this city is against public policy, a dangerous precedent, and can but result in intricate and alarming contests between the city of Boston and the West End Railroad Company.

The order was assigned to the next meeting.

The Electric Club.—The regular meeting of the Electric Club will be held at the rooms, 7 Park street, at 8 o'clock this evening. T. W. S.

Boston, May 6, 1889.

OUR CHICAGO LETTER.

Electrical Incorporations.—I have been asked if I was not a little severe upon electrical enterprises, in a late communication to the REVIEW, and I answer, emphatically, no. What I was severe on, and like Jack Bunsby, "wot I says I sticks to," was bogus, fraudulent, misnamed electrical corporations, that are conceived in iniquity, born of sin, die an ignominious death and are forgotten, or having managed to live until some tender foot has dropped what he has in the so-called enterprise, bursts its bubble existence, and "the other fellow has de experience." That class of enterprises needs to be hung on the horns of the moon, or pasted on the front gate post, or tacked to the city garbage carts, everywhere, that he who runs may read while he holds his nose.

Time will cure all this. In the early days of any new branch of industry the population of floating swindlers, ever on the alert for a snap, grasps at the new situation, knowing that the dear public is its oyster.

Now, the exposition of that class of frauds cannot, in my opinion, be too complete, too often repeated for the good of those genuine worthy enterprises, where men of ability and integrity put their money and brains and shoulders to the wheel, openly and fairly advertise their wares, and carry on an intelligent, legitimate business, with a reputation at stake for probity and fair dealing. That class is a widely different one from the class to which the "electrical speculator" belongs.

Storage Battery Company.—Messrs. J. B. Long, A. C. Bales and Louis Schissler are the incorporators of a new battery company just organized at Chicago, with a capital of $500,000 for the manufacture of batteries, motors, illuminating apparatus for vehicles and buildings, and supplying electric power, implements and supplies.

Matrix Machine Company.—The Chicago company has been incorporated with a capital of $1,000,000, by E. B. Springer, G. M. Brinckerhoff and P. H. Gunckel.

Very Easy to Do.—To find fault is certainly easier than to be mistaken. They had a funny episode at one of our first hotels on the evening of the Centennial exhibit. A guest wanted to use the telephone and it wouldn't ring. He made some lurid biblical extracts and reported it to the clerk. Clerk tried it, and the next song on the programme was a duet of much the same religious character as before, with a chorus of something or other telephone girl. Another clerk came to the rescue, and a dance followed with a breakdown chorus of blankety blank lazy hello girl. Somebody peeked behind the bell, pulled out the plug that Johnny—all telephone boys are Johnny here—had put there when he went to the fireworks show, and the hello girl took her turn at making a racket with "any man who rings, and rings, and rings, and never answers when a body speaks." Johnny is enjoying a vacation now.

Magnetic Attraction.—The club members, since the vacation of the old quarters, are "scattered like." But at almost any hour of the day, the magnetism of the new house draws a lot of them in, and they stand round in the kalsomine, and chips, and plaster, and glory in advance over the good time coming, which will shortly be here. The next regular meeting will be held in the new house.

Electro-Matrix Row.—There is trouble among the electro-matrix people. A company is just being formed here, and there is an older organization in Minneapolis. The Chicago company is to have $1,000,000 capital, and its projectors are E. B. Springer, of Chicago; Geo. M. Brinkerhoff, of Massachusetts, and C. L. Redfield, of Minneapolis, the latter of whom was employed by the original company to make the drawings for the original patent application. Mr. Redfield claims that he was the principal inventor, and was promised a large slice of the stock which he has never received. The company, he says, is filing applications for patents, leaving him out in the cold, or as he says, "frozen out," and he, having plenty of money to back his efforts, will contest the validity of the old company's claims, and will commence the manufacture of machines as soon as he can obtain his patents. C. Wright Davidson, secretary and treasurer of the original company, denies all Redfield's claims.

Telephone.—The telephone question is just a trifle different this week. Distribute the paragraph I asked saved and keep this in place of it.

An Active Young Man.—Mr. George Cutter, whose branching out for himself I noticed a short time ago, has up to date sold over half a million feet of simplex wire, gained 12 pounds avoirdupois, played two games of pool and stuck Dr. Mason for the cigars. George is hustling.

"Help Me, Cassius!"—In the City Council meeting of the 22d, resolutions were adopted urging the legislature to pass an act which will give to this city and other muncipalities power to regulate the charges of gas and telephone companies. C. C. H.

Chicago, May 4, '89.

OUR LETTER FROM THE SOUTH.

Electric Lighting.—The Board of Regents of the State Lunatic Asylum at Columbia, S. C., have let contract for the erection of an electric light plant to the D. A. Tompkins Company, of Charlotte, N. C., at $2,900.

The Fort Wayne Electric Light Company will put in an incandescent plant at once at Jackson, Miss.

Electric Railways.—The Raleigh (N. C.) Steel Railway Company has decided on the adoption of electricity.

The Americus (Ga.) Street Railway Company has been organized, with John B. Felder, president; W. B. Harrold, vice-president, and W. E. Murphy, secretary; to build an electric railroad eight miles long. Capital stock of the company is $50,000.

The Vicksburg (Miss.) Steel Railway Company has decided to operate the road by electric motors, and are negotiating for them.

The Fort Worth Loan and Construction Company, of Fort Worth, has bought the Gainesville (Texas) Street Railway, and will extend it to 10 miles in length and change to electric power. This company has also purchased the San Antonio street car line, and will operate it by electricity.

The East Atlanta (Ga.) Land and Improvement Company is now building the electric street car line. It will be over two miles long, Thomson-Houston system.

Electric Train Signaling.—Rev. B. Cade, a Baptist minister of Raleigh, N. C., is the inventor of a system for despatching and handling running cars by telegraph. The system will be exhibited soon.

The Texarkana Gas and Electric Light Company, at Texarkana, Ark., capital stock, $200,000, has been chartered. They have purchased the electric light plant from the ice company of Texarkana for $30,000, and the works of the gas company, and will consolidate them.

A company is being organized to erect an electric light plant at South Pittsburg, Tenn.

An electric light plant is to be erected in Pulaski City, Va.

The Winchester, Va., Gas Company will put in an arc and incandescent electric light plant.

The Piedmont, Va., Electric Light and Power Company, capital stock $20,000, has been chartered.

The Schuyler Electric Light Company, Alexandria, Va., offered to furnish an electric light plant, capacity 60 arc and 100 incandescent lights, for $14,000.

J. B. Barrett & Co. are the parties asking for franchise to build an electric light plant and electrical railroad at Wytheville, Va.

Charleston, S. C., May 1. E. A. O.

Julien Accumulator Put to a Novel Use.

Not even the impressive and dignified Centennial civic parade could escape the push and enterprise of the electrician.

In looking at the floats, many of which contained complete plants in operation, people wondered "what made the wheels go round"—answer, the storage battery. On the first float of this character was noticed the announcement that the machinery was operated by an electric motor obtaining current from the Julien storage batteries. Thirty of these accumulators operating a two horse power motor, ran a complete chocolate manufactory the entire day.

—— Judge Wallace, of San Francisco, has denied the application of the Electric Improvement Company for an injunction against Chief of Police Crowley to restrain him from interfering with the company in erecting poles in the streets of that city.

PERSONAL.

Mr. W. C. Hayes, of the National Carbon Company, Cleveland, was an attendant on the Centennial festivities in this city, accompanying his father, ex-President Hayes.

Prof. Henry A. Rowland, the distinguished Professor of Physics of Johns Hopkins University, was a New York visitor the past week, and met several of his electrical friends at the Centennial ball.

Mr. E. G. Main, formerly with the secretary of the National Telephone Exchange Association, will in future represent the National Galvanic Battery Company, with headquarters at 18 Cort andt street, New York.

Gen. O. E. Madden, president of the Empire City Electric Company, is regaining his health at Atlantic City. A very severe cold coupled with overwork compelled the General to take a complete rest for a few weeks.

Prof. E. P. Roberts, Professor of Electrical Engineering at Cornell University, is to enter the employ of the Brush Electric Company, of Cleveland. The electric department will loose a valuable electrical worker with his departure.

Dr. Leonard Paget, electrician and chemist, formerly assistant professor of applied electricity in Kings College, England, has associated himself with Mr. C. J. Kintner, under the firm name of Paget & Kintner. They propose acting as electrical and chemical experts, both in the patent office and courts, and the rendering of opinions upon all matters of such nature.

Hon. John C. English, of the Bridgeport Electric Light Company, of the New England Electric Supply Company and several other electrical companies of Connecticut, was a New York visitor last week. Mr. English is a brother of Col. James English, and both are progressive and energetic young men, wide-awake to the developments constantly being made in the electrical industry.

Captain W. L. Candee, N. G. S. N. Y., 23d Regiment, sails on the "La Gascogne" for the Paris Exposition, Saturday of this week, at 1.30 P. M., and will be absent about six weeks. Captain Candee is the well-known treasurer and manager of the Okonite Company, and will look after the foreign interests of this prominent wire manufacturing company while abroad.

Mr. Geo. A. Hamilton, for many years chief electrician of the Western Union Telegraph Company, resigned the first of May to accept a responsible position with the Western Electric Company, New York. Mr. Hamilton is noted for his careful, conscientious and reliable electrical work, and the Western Electric has greatly strengthened its staff of bright young men in securing the services of Mr. Hamilton.

The Erie Telephone Company.

The following is the treasurer's report of the Erie Telegraph and Telephone Company, giving statement of earnings, expenses and construction for the year ending March 31st, 1889:

EARNINGS.

Agency	$17,812 44	
Exchange	598,740 37	
Extra Territorial and Toll	51,464 96	
Messenger	786 84	
Miscellaneous	8,368 01	
Telegraph Commissions	726 86	$677,839 48

EXPENSES.

General Expense	$16,840 17	
Instrument Rental	135,895 23	
Insurance and Taxes	8,391 46	
Miscellaneous	16,482 92	
Operating	156,275 87	
Rent	11,162 68	
Reconstruction, Repairs and Maintenance	97,911 07	$442,959 40
Net earnings		$234,880 08
Construction (for the year)		39,063 21
Earnings above all disbursements		$195,816 87
Number subscribers added		772
Total connected March 31, 1889		11,315

Statement of assets and liabilities March 31st, 1889:

ASSETS.

Licenses	$2,342,965 97	
Plant	2,350,000 00	
Treasury Stock	200,000 00	
Supplies on Hand	36,060 96	
Suspense Account	13,112 30	
Accounts Receivable	55,881 00	
Construction	529,989 33	
Cash	30,060 52	$5,557,060 08

LIABILITIES.

Capital Stock	$5,000,000 00	
Accounts Payable	17,018 70	
Surplus	93,356 03	
Profit and Loss	446,735 35	$5,557,060 08

CHAS. J. GLIDDEN, *Treasurer.*

Telephonic News

*** The Camden, N. J., Fire Commissioners have granted permission to the Singer Telegraph Company to connect their system of fire alarm signals with the instruments of the city.

*** The Centennial decorations of the REVIEW building, 13 Park Row, were equal to any in the vicinity, and were put up by Mr. F. B. Coleman, the efficient engineer of the building.

*** The legislatures in Kansas, Texas, Ohio, Minnesota and Dakota, have adjourned without passing any telephone legislation. The legislatures will not convene again until 1891, with the possible exception of Ohio, which may meet next year.

*** The employés of the American Electrical Works, Providence, have formed the Electrical Beneficial Association, to pay sick benefits. Its officers are Mark Evans, president; James H. Sweeney, secretary; A. H. Thornton, treasurer. These associations are very commendable.

*** A. F. McGrew, the electrician of the San Francisco Underground Conduit Electric Light, Telegraph and Telephone Company has applied to the Board of Supervisors for a franchise to lay underground conduits for the conveyance of electric light, telegraph and telephone wires in that city.

*** The Governor and Council of Maine have assessed the following taxes against the telegraph and telephone companies of the State, the rate being 2½ per cent.: New England Telegraph and Telephone, $1,600; Maine Telephone, $1,375; Western Union, $3,000; Great Northwestern, Toronto, Ontario, $125; Eastern, $450; International, $1,375.

*** The Senate of Missouri has defeated Dempsey's telephone bill by a vote of 11 to 18. The bill passed the House some time ago and had excited considerable interest since that time, as those interested had been watching eagerly to see what the Senate would do in regard to the measure. It fixed the telephone charges in cities of 100,000 and more at $4 per month, and in cities of less than 100,000 at $3 a month. It was a very proper bill—to defeat.

*** At a special meeting of the stockholders of the Empire and Bay State Telegraph Company, held at No. 34 Broadway, New York, the following directors were elected: Wendell Goodwin, Eugene Durnin, James A. G. Beales, John Byrne, William Walworth, William H. Hurst, Joseph Leavy, N. J. Newman, George H. Wirth, H. B. Sloven, James J. Phelan. At a subsequent meeting of the board of directors the following officers were chosen: President, Wendell Goodwin; vice-president, James J. Phelan; treasurer, James A. G. Beales; secretary, George H. Wirth.

*** The longest telephone wire in the city, says the St. Louis *Post-Despatch*, is now being put up over the line of the new water conduit by the fire alarm and telephone linemen in the employ of the city. It will be 10 miles long. At present there is a direct wire three miles long stretching from the Water Commissioner's office in the City Hall to the water works in North St. Louis. From that point to the Chain of Rocks the distance is seven miles. The men are now engaged planting 300 poles and stretching the wires over them. As it will be three years before the conduit is finished arrangements have been made to enable the Water Commissioner to communicate with any part of the line. To do this, movable telephone houses, something like the old patrol box, will be carried along as the work progresses.

The Electrical Fraternity and the Centennial Celebration.

There were a number of out of town electrical people in attendance on the Centennial festivities in New York last week, and a number of well known members of the Electric Club were present at the great Centennial ball. Among the latter were Mr. E. T. Gilliland, Capt. Henry Erben, U. S. N., John C. Tomlinson, C. H. Barney, Lieut. F. W. Toppan, U. S. N., J. J. Carty, F. Z. Maguire, C. H. Jackson, J. P. McQuaide, Dr. S. S. Wheeler, D. L. Gibbens, Joseph Howard, Jr., Grosvenor P. Lowrey, Col. W. L. Strong, C. Selden, E. N. Dickerson.

Mr. Tomlinson and Capt. Erben were members of the committee of 200 who had charge of the entire three days celebration. The former as secretary of the Army and Military Committee, and the latter as the representative of the U. S. Navy on the Navy Committee, have devoted a great deal of time and work to the cause. Capt. Erben was one of the committee that went down on the U. S. cruiser "Despatch" to meet and welcome President Harrison, the commander of the "Despatch" being Capt. W. S. Cowles, U. S. N., a popular member of the Electric Club. Mr. Tomlinson was one of the committee of four selected to receive the President at the grand stand where he reviewed the parade. Mr. John W. Handren was one of the guard of honor from the foot of Wall street to the Equitable building. It will be seen from the above that the electrical fraternity did its share in managing the celebration, which was, of course, a great success.

Company B, 23d Regiment, under command of Capt. Candee, treasurer of the Club, was applauded at many points along the line where electrical people were assembled. This was particularly noticeable as his command passed 13 Park Row, and also at 729 Broadway, where Mr. A. H. Patterson and Mr. Cyrus O. Baker, Jr., and others gave the Captain and his splendid company a great ovation. Capt. Zalinski, U. S. A., was on the staff of Gen. Schofield, and is a widely known member of the Club.

At several points along the line of march electrical audiences were assembled. The view of the military parade from 13 Park Row was one of the best in the city, and the front offices of the REVIEW, overlooking Broadway, were filled with a party of electrical ladies and gentlemen who enjoyed the magnificent spectacle from the beginning to the end. At 257 Fifth avenue the Metropolitan Phonograph Company put up a very large review stand, and handsomely entertained a great many of their friends, not forgetting to dispense an elaborate and satisfying lunch. The Western Union building on Broadway was a very popular point, also.

The electric lighting of the dining room at the ball was most beautiful, and received the highest compliments from every one. It was done by the Edison Electric Illuminating Company, and received the personal attention of the vice-president and general manager of the company, Mr. John I. Beggs.

Broadway was temporarily lighted by the United States Illuminating Company, and our visitors saw a fairly well lighted thoroughfare.

Philadelphia Also Kicking.

The subject of removing the poles and wires from the streets of the city came up for consideration before a sub-committee of the Committee of Councils on Law, Philadelphia, to which had been referred the resolution offered in Select Council, "Directing the Director of Public Safety to notify the several telegraph, telephone and electric light companies to remove all the poles and wires from the streets in the built up portion of the city by the 1st day of October, 1889."

Representatives of the various companies were present and contended that it would be impossible to place the great number of wires underground in the limited time allowed by the ordinance. It was further claimed that underground systems had generally been found impracticable. No action was reached by the committee, which adjourned subject to the call of the chairman.

Electric Street Railways.

Captain Eugene Griffin, general manager of the street railway department of the Thomson-Houston Company, read a paper on "Electric Street Railways" before the Society of Arts, in Boston. President Francis A. Walker, of the Institute of Technology, presided, and there were present a large number of prominent electrical people. Captain Griffin first showed the necessity for electric roads by carefully prepared statistics on the passenger traffic in Boston and New York, and after a few words of introduction, illustrated by blackboard drawings, roughly showing the course of the current in the overhead wire system, proceeded substantially as follows:

The dynamo or generator and the motor are theoretically the same. If a steam engine be belted to an armature pulley and the armature pulley be made to revolve, a current of electricity is passed through the machine, the armature is made to revolve, and by belting to the armature pulley, mechanical power is available. In this way one dynamo will convert the mechanical power of the steam engine into electrical power, and the electrical power may be carried through the wires to the second dynamo, perhaps five miles away, where it is reconverted into mechanical power, and so made available for any desired purpose. The second dynamo is called the motor, and differs from the first not in principle, but only in details which make it better suited for its special work. In this way we do away with the zinc fuel and come back to coal, except in those places where we are fortunate enough to have water power.

A brief description of the dynamo or generator and the motor is essential to a proper understanding of this subject.

The modern dynamo-electric machine is simply an application on a larger scale of Professor Faraday's discovery that if a wire be moved through the magnetic field of a permanent electro-magnet, a current of electricity is produced in that wire. A dynamo machine consists of a pair of field magnets, between whose poles or extremities revolves a soft iron rotating support, wound about with a series of coils of wire, in which the current is developed. The revolving body is called the armature. It is generally made to revolve by belting a steam engine to a pulley on the armature shaft. As each wire moves through the magnetic field of one pole of the magnet, the induced or generated current in the wire is in one direction; as the wire moves through the field of the other magnet pole, the current is in the opposite direction. The current taken from the poles of the machine or generator, as it is usually called, would therefore be alternating, were it not for the device called a commutator. This consists of a copper cylinder on the armature shaft, divided into as many segments as there are separate coils of wire in the armature, each segment insulated electrically from the others and connected with its own armature coil. This commutator revolves with the armature, and against it are pressed two copper brushes, as they are called, which do not revolve. These brushes are the current collectors, and when they are connected by a metallic wire five inches or 10 miles long, so as to close the circuit, a direct current flows through this wire as long as the armature is made to revolve. Without going into details it is sufficient to say that the brushes are so placed that as each segment of the commutator comes in contact with the brush, the induced current in the corresponding wire is flowing in a constant direction, so we have a direct instead of an alternating current. As a matter of fact the armature is not made up of separate coils; but the connections are so made with the commutator segments that we may theoretically regard the coils as separate.

The motor is practically the same as the generator, except that the power applied is electrical energy and the power obtained is mechanical. The current coming from the generator goes to the brushes on the motor, thence to a segment of the commutator and so to the armature coils. The wire with a current flowing through it in a given direction is repelled by one pole and attracted by the other. The powers of attraction and repulsion compel the armature to move, it revolves and we have mechanical energy. We gear the armature to the car axle and we have motion.

There are two general methods of using electricity for the propulsion of street cars.

1. The direct method, by conductors extending from the dynamo along the track.

2. The indirect method, by the use of storage batteries, secondary batteries or accumulators.

In the direct method the conductors may be overhead, underground or on the surface.

In the conduit system the conductors are placed in a conduit between the rails or between the tracks. The wires must be bare and yet must be thoroughly insulated from the ground—a condition very difficult to obtain under such circumstances. A slot about five-eighths of an inch wide gives access to the conductors by means of a contact plow, but, unfortunately, also permits the flow of water, slush, mud, etc., into the conduit. The present state of the art in this respect is illustrated by the conduit on Boylston street in front of this building.

The overhead wire is suspended from poles by brackets or from cross-wires which span the street between poles on either side. When the street is of sufficient width, poles are placed in the center of the street between the two tracks, with bracket arms carrying the conducting wires. These poles are placed about 125 feet apart, and from actual experience are found to present little or no obstruction to traffic. The wires may be single or double. When single wire is used, the rails are utilized for the return current. When two wires are used, one wire carries the outgoing and one the return current. Contact is obtained with the wire by an over-running or an under-running trolley. The over-running trolley is a light carriage with one or more wheels resting on the wire. A flexible conductor carries the current down to the car. The trolley is pulled along by the flexible conductor. The objections to the over-running trolley are that it is difficult to keep the trolley on the wire, it is difficult to replace the trolley when it comes off, and any automatic system of switching on to a turnout, branch or Y is impossible. The latter is such a serious objection that except in special cases the over-running trolley will never be used. In the under-running trolley a light arm of the requisite length is mounted on the top of the car, reaching up to the wire. A wheel on the end of the arm is pressed up against the wire by means of springs at the other end, and the current is carried from the wheel down through the arm itself if made of metal or through wires if the arm is made of wood. This arm is usually called the contact bar. The under-running trolley is automatic in its action at curves, turn-outs, etc., and follows the direction of the car. It turns on a swivel through the entire circle and moves through an arc of 90° in a vertical direction.

In the storage system, a battery of about 120 cells is carried on the car and the motors are driven by the current from this battery. The advantages of this system are:

1. The cars can run on any track.

2. No wires, either overhead or underground, are required.

3. Each car is more independent than is the case in other systems.

The disadvantages are:

1. The extra weight of about two tons on each car. The power required to carry this dead weight in addition to that required to drive cars required by the other methods.

2. The lack of efficiency in the batteries. The highest efficiency claimed is 82 per cent. The actual practical efficiency is stated by many authorities as about 70 per cent.

3. Storage cars cannot be regularly operated on grades exceeding 5 per cent. or 6 per cent. The power required on grades make too great a demand on the batteries.

4. The expense. The cost of two sets of batteries per car is about $3,000.

5. The cost of maintenance. Batteries have not yet been made of sufficient durability to be operated economically.

There are four qualities which the electric motor must be shown to possess before it will be generally adopted for street car work. These are efficiency, economy, durability and reliability.

1. As to efficiency: The steam engine is not an efficient machine. If we can utilize 15 per cent. of the units of energy stored in the coal we are fortunate. In other words, we must expect a loss of 85 per cent. of the heat units in converting the other 15 per cent. into mechanical power.

The dynamo electric machine, on the other hand, possesses a high degree of efficiency. No good generator runs below 92 per cent. efficiency. The loss in the line depends upon the amount of copper used in proportion to the current to be carried. The size of the conductor is generally calculated for a loss of 10 per cent. The efficiency of the motor under favorable circumstances has been shown to be but little below the generator; in actual tests running as high as 91½ per cent. In practice it would not probably be taken higher than 35 per cent. Starting then with 100 h. p. in the steam engine we lose 8 per cent. in the dynamo in converting the mechanical into electrical energy. The output of the generator is then 92 h. p. In the line we lose 10 per cent. and deliver 82.8 h. p. to the motor. Here we lose 15 per cent. and on the final reconversion into mechanical energy on the car we have 70.4 h. p. out of the original 100 h. p. By no other known method could this power be transported to such a distance with so little loss.

2. Economy: This is perhaps a quality which appeals more directly to the railway official than any other. What will it cost? An electric railway connects Omaha with Council Bluffs across the new bridge. I am creditably informed that to run 20 cars per day they consume five tons of slack for which they pay $1.14 per ton. This is 28½

cents per day for fuel. These cars are scheduled at 15 miles per hour, and the average daily mileage per car is over 100 miles. Where natural gas or water is available, fuel may be even cheaper. On many different roads from numerous measurements it has been found that where the grades are slight the power required averages from five to eight horse-power per car. The consumption of fuel varies from three to six pounds of coal per horse-power according to the style of engine and its more or less economical operation. Of course a road operating only one or two cars would show abnormal results in every way, and these averages are only true of roads operating a number of cars—10 or more. The wear and tear on the generating plant does not exceed three per cent. The depreciation on line work does not exceed or even equal 10 per cent. The depreciation on car equipment has been variously estimated at from 10 to 20 per cent.

On some roads, under very favorable conditions, the cost of renewals and repairs to electrical apparatus has been but little below one dollar per day per car in actual operation. On other roads, under very favorable conditions, the cost of maintenance has been less than 25 cents per day per car.

A mean of the reports obtained from 11 roads in actual operation under different conditions shows a daily cost of operation of less than $2.50 per car, not including drivers and conductors. Experience has shown that it is well within limits to put the saving of electric over horse-power at 25 per cent. In some cases a saving of 50 per cent. has been shown. The secretary of the Des Moines Broad Gauge Railway Company, under date of January 3, 1889, writes as follows: "The receipts from four cars electrically are four times more than five cars by horses."

3. Durability: The Washington road has been in operation for over six months. They now have seven motor cars and seven tow cars. The latter are double deck cars on which 160 fares have been collected on one trip. These cars are hauled around sharp curves and up a five per cent. grade by two 10 horse-power motors. While the track was new it settled. A car left the track, and while it was being pried back one of the motors was injured mechanically. With this exception not a single armature or field has been burned, and the gears show but trifling signs of wear. The road has operated without any repair shop, and practically without any repairs up to the present time.

At Lynn, Mass., a single car has been in daily operation since November 19th of last year. It runs 93 miles per day, and the 1.7 miles of track contains 11 curves and numerous grades ranging up to a maximum of 12 per cent. The durability of the electrical apparatus under such unusual conditions has been remarkable.

4. Reliability: On the Lynn road, above referred to, the single car has made its daily trips with but very few departures from the schedule. On one occasion the car axle broke, due to a flaw in the metal. On another occasion the belt slipped from the engine at the power station. Since the middle of February not a scheduled trip has been lost from any cause whatever, nor has the car failed to run on time. No one can look at the daily record of this car under conditions which would prevent horse car work, and doubt the reliability of electrical apparatus. On the Cambridge line of the West End road the conditions are unusually bad. During the month ending April 19th, the schedule called for 5,912 round car trips. Of these the electrical cars failed to make just four trips.

As the railway employés become more familiar with electrical apparatus and learn more of the details of handling the cars, accidents, mishaps and lost trips will grow fewer and fewer; but the records above referred to suffice to prove the reliability of the electric motor.

Storage battery cars are in operation on one road in the United States—the Fourth avenue line in New York City. Conduits have been built in several places. In San Jose, Cal., and in Denver, Col., they were complete failures. In Allegheny City, Pa., the conduit has operated with considerable success. In Boston it has not been a marked success. There are at the present time over 100 roads in operation or under contract where the overhead wire system is to be employed. From this we may infer that the storage battery and conduit are yet in an experimental stage, while the overhead wire is a pronounced and demonstrated success. What the future of storage batteries and conduits may be no one can tell, but we all hope that the difficulties encountered may be overcome, as the storage system is unquestionably the ideal system.

The objections usually urged against the overhead wires are:

1. They are dangerous, as they carry death dealing currents.
2. They are eyesores.
3. The poles obstruct the street.
4. They are in the way in case of fires.

Now the railway wire should not be confounded with other electric wires. Arc and incandescent wires, telegraph and telephone wires, have simply to carry the current from the point where it is generated to the point where it is to be used, and so far as this purpose is concerned they may be above ground or underground. The railway wire, on the other hand, must have current taken from it every differential of an inch from one end to the other. The wire must be bare that the trolley wheel may be in constant contact. To put this wire underground and to keep it properly insulated is a very difficult problem from burying the other wires. The railway wire cannot be considered in the same category with other electric wires. Now, as to danger. For railway work we use a constant potential generator, and the cars and motors are placed between the two conductors on the multiple arc system. One conductor, the overhead wire, runs out from one pole of the generator; the other conductor, the rail, runs out from the other pole of the generator. An electrical connection between these two conductors completes the circuit, and the current flows through the connecting material, whatever it may be. If it be the motors on a car, then the cars move; if it be a man, he receives a shock.

Each connecting material, be it car, man, wire, or whatsoever, receives a current of electricity which is absolutely and always determined by Ohms law that the current is equal to the electro-motive force or pressure divided by the resistance. The electro-motive force is always 500 volts. With several cars in operation, the amperes of current in the overhead system near the generator may run as high as 180, but each car takes its own proportion according to its resistance. The average resistance of a man is 4,000 ohms. If he places himself in the circuit he will receive a current which is measured in amperes by dividing 500 by 4,000, or, in other words, a 500 volt current can only drive 1/8 of an ampere through the average human body. It would not make a particle of difference to the man whether the overhead wire he touched was carrying a current of 1 ampere, or 180 amperes or 180,000 amperes. The effect in his case would be the same; he would receive 1/8 of an ampere. Were this not true, then the whole multiple arc theory would be false, and electric railways, as at present operated, would be impossibilities. It would then make no difference as to danger whether one or a million cars were in operation on the line.

To make this matter plain to those unfamiliar with electrical terms, we may suppose the overhead wire to be a large pipe or main through which a pump (the generator) is forcing water. The rails, electrically connected, as another large pipe through which the water is to be forced back to the station. Suppose the diameter of these mains is 12 inches. If they are closed at the outer ends we may fill the overhead main, but after that no water can flow until we connect the two pipes. Now we will put in a one inch pipe connecting the upper main with the lower main, say 1,000 feet from the pump or generator. A certain amount of water will flow through the connecting pipe, which amount depends upon its size—one inch—and upon the pressure of the water in the upper main. From the generator to the one inch connecting pipe the same amount of water flows in the upper main as flows down through the connection, no more and no less. Beyond the connecting pipe, no water is flowing in the upper main.

Now we will put in a second connecting pipe 1,000 feet beyond the first. For the first thousand feet we have twice as much water flowing as before, half of it goes down through the first pipe. It is the same with every additional connecting pipe we put in until we reach the capacity of the upper main or the capacity of the generator to force water through it. By increasing the pressure, we know that we could force more water through the one inch connecting pipe, but so long as the pressure remains the same, the quantity flowing through the inch pipe will be the same, whether the upper main be 12 inches, 12 feet or 1,000 feet in diameter.

The analogy to electric railway work is close. Electricity takes the place of the water and the connecting pipes are electric cars, or it may be some unfortunate man placed where he ought not to be. He is only an inch pipe, however, and the pressure (500 volts) can only drive so much electricity through him.

The current for railway work has been fixed at 500 volts, as this is well within the safe limits. A shock from 500 volts is unpleasant but not dangerous. No man, women or child has ever been killed or even seriously injured by a 500 volt current. The United States Senate had this question before them last summer. After a thorough investigation the District Committee unanimously reported that a 500 volt current is not dangerous. If there was any real question of its being dangerous we would use 400 volts or 300 volts. The objection to this, however, is that by reducing the voltage we must correspondingly increase the quantity in order to retain the same horse power, and an increase in quantity (amperes) means an increase in the size of the overhead wires, which is objectionable. The danger limit with the electric current is probably about 1,000 to 1,200 volts.

The poles cannot obstruct the street, as they are inside the curb. They are just as much of an obstruction to the sidewalk as lamp posts and awning posts are; no more and no less. If the sidewalks be narrow and permission can be obtained from the property owners, hooks or eye-bolts may be placed on the buildings, the cross wires fastened to these and the poles done away with entirely.

Every overhead wire is objectionable to the fire commissioners; the railway wire is less objectionable than any other, because there is but one wire and this wire is in the middle of the street away from the buildings.

If the single overhead working conductor is insufficient to carry the current necessary to operate the cars, it must be reinforced by feeder wires. These feeder wires may be insulated and may be placed underground. The overhead wire may be divided into sections of three, four, six or 1,000 feet in length. At the ends of each section a cut-out or switch may be placed on the pole like a fire alarm box, so that in case of fire the current may be cut out of the section or sections in the vicinity of the fire. The firemen would then have no difficulty in handling the wires, which in any event are easily cut by pliers with insulated handle. As ladders are usually raised parallel to the face of the building, rather than across the street, and as the cross wires are 125 feet apart, it would be a very rare thing that the railway wires would be found to interfere at all with the operations of the Fire Department. As Prof. Thomson pertinently remarked to the insurance representative: It will not be long before you will be taking power from these wires to put out your fires. It will not be long before we have electric motor fire engines.

Charles J. Van Depoele and Leo Daft were the pioneers in the modern electric railway work in this country.

The first roads were built in 1884–5. The new motive power was, however, viewed with suspicion, and progress was slow until the Richmond road was built by the Sprague Company in 1887–8. This road did much to popularize electric motors. The rapidity with which the horse is now going is shown by the growth of the railway business of the Thomson-Houston Electric Company, one of the several companies working in this field. In the spring of 1888 this company purchased the patents of the Van Depoele Electric Company, of Chicago. At that time there were some 14 roads operating under the Van Depoele electric system. The first Thomson-Houston car was started at Crescent Beach, Mass., July 4, 1888. On the 1st of April, 1889, in less than nine months, there were 18 roads with 104 motor cars in operation, and 33 roads with 210 motor cars under contract. The Americans are essentially a fast people. We live fast, and, unfortunately, we die fast. But as long as we do live we go. Any time-saving device is gladly welcomed, and at once becomes popular. The limit of speed with horse cars is about eight miles per hour. With electricity the only limit is what we may fix as a safe speed. If horse cars are delayed, there is little or no chance of making up lost time. The reverse is true of electricity. With electricity we have rapid transit, and we can obtain it in a very simple and not too expensive way. Electric motor cars do not smoke or give off noxious gases, or make disagreeable noises. It is not necessary to run them in the air or under the ground, though they would run well in either position. They are safe, clean, fast and reliable. They do not keep the street in an unclean and unhealthy condition. They do not take up as much of the street as do horse cars, for they have no horses. They are brilliantly lighted at night.

All of these qualities appeal to the public, and the verdict everywhere is favorable to electricity. The United States Senate and House of Representatives in reporting on a proposed extension of the Washington road, said: "It is undoubtedly the best electric railway in the United States, and beyond comparison superior to any horse railway."

To obtain these advantages the public must aid the railways. The rails must be of sufficient weight and of such form as to best carry the increased weight and stand the increased speed. Some form of girder rail weighing not less than 45 pounds to the yard is best suited to this work. The rail must be so placed as to be easily kept clean, and for this purpose should be slightly elevated above the surface of the street.

On the part of the railway companies, while the first cost is great, they can look forward to reduced operating expenses, a greater car mileage per day, and a great increase of traffic. Electricity has undoubtedly come to stay.

At the close of the lecture the subject was thrown open to discussion, and many interesting points were brought out by the questions asked the lecturer, which were in every case clearly and unhesitatingly answered.

TELEGRAPHIC

.... Guatemala is connecting her eastern coast with a cable telegraph system.

.... A new police signal system has just been introduced at Fall River, Mass., costing from $10,000 to $15,000.

.... The police commissioners and Mayor Haynes, of Newark, N. J., are busily employed in trying to discover which of the numerous police telegraph, telephone and patrol systems offered for use in Newark is best adapted to the needs of the city.

.... The International Printing Telegraph Company, handling the invention of Mr. J. H. Linville, of Philadelphia, is reported to have sunk a pile of money and is now bankrupt. This was one of those inventions that the daily press made so much of, but the technical press never saw anything of much practical merit in the scheme.

.... The plant of the Mutual District Messenger Company at Newport, R. I., was sold at sheriff's sale last week to satisfy an execution made upon it by John Waters for a note held by him of $800. The plant was bought by Mr. Waters for $500. The company, which was organized in 1885 with a capital of $25,000, was then reorganized under the name of the Newport District Messenger Company and the following officers elected: President, John Waters; secretary, George A. Pritchard; treasurer, Angus McCloud; board of directors, W. S. Stratford, J. J. Carry, Frank Morgan, Simon Davis, George A. Pritchard. The company will be in thorough condition in about 30 days.

.... The Sheriff of Franklin County had a big contract on hand recently. He received a writ of attachment, issued from the Superior Court of Cincinnati, that involded more than the ordinary run of attachment suits. It was in a suit brought by Edward Hart, receiver of the American Rapid Telegraph Company, for the collection of the sum of $225,000 and interest from April 13th last, from the United Lines Telegraph Company. The latter company owns lines of telegraph extending from the Ohio line, near Eaton, through Eaton, Columbus, Newark and Coshocton to Steubenville, and thence to Pittsburgh. The attachment is made on all the property of the company in sight, including the poles, wires, office effects, instruments, etc. The line of wires pass through this entire country from one end to the other, east and west. This made the service of the writ quite a laborious and intricate job, as the Sheriff was obliged to go over the county to find the exact number of poles, miles of wire, instruments, batteries, etc., within his bailiwick, and take charge of all the loose and portable property he found.

.... A pleasant-faced, rather stout, man stood at the corner of Fulton street and Broadway recently loooking steadily up at the net work of wires overhead, says the *Mail and Express*. Their bewildering webs seemed to fascinate him. Although dressed very nicely his appearance was not quite that of a native of New York. His color, too, seemed too fresh and healthy for a metropolitan worker. When he had stood looking upward for about 10 minutes one of those rather previous young New Yorkers who are always ready to accost a stranger walked up, and evidently taking him for a country man, began to explain the uses of the wires and the general contention existing in relation thereto. The young man was well informed and talked glibly about Mayor Grant, the Subway Commissioners and most freely about Jay Gould. The bright, blue eyes of the elder man began to take on a wearied air, but he listened patiently, just a suspicion of a smile lurking around the corners of his mouth. Finally the fresh young man was talked out, and, nodding to the stranger, walked away. Then the man that had been taken for a countryman, gaping at metropolitan wonders, resumed his examination of the wires. He was Mr. W. C. Humstone, the general superintendent of the Western Union Telegraph Company.

* * Surveys are being made in Augusta of a prospective electric street railway.

* * Beverly, Mass., is talking of establishing an electric power company, to benefit the large manufacturing interests of the town.

* * The electric cars used on the Naumkeag road at Salem, Mass., last year have been replaced by eight new cars for this season's travel.

* * Mr. John H. Withington has recently bought out the electrical supply business in Lawrence, Mass., formerly carried on by Mr. A. S. Bunker.

* * The new street railroad at Ann Arbor, Michigan, is to be constructed by July 1st, and will use horse-power until they can get a storage battery motor.

* * Bids have been advertised for, by a local committee, for putting in an electric motor to operate the draw of the New Bedford and Fairhaven bridge.

* * The Union Railroad Company of Providence has petitioned the city council to operate its cars upon the several tracks within the city by electric storage batteries and motors.

* * The Americus, Ga., Street Railway Company has been organized with Jno. B. Felder, president; W. B. Harrold, vice-president, and W. E. Murphy, secretary, to build an electric railroad eight miles long. The capital stock of the company is $50,000.

* * During the last week the Sprague Railway at Atlantic City was started, and the operation of the road on the trial trip of the cars was perfectly successful, and the cars ran over the entire distance of the road at a speed exceeding 15 miles an hour towing another car behind them.

* * At a special meeting of the Town council of Bristol, R. I., held Wednesday evening, it was voted that the clerk notify the electric light company that the council would like to meet the agent of said company relative to lighting the town by electricity, as per vote of town meeting on the evening of May 6th.

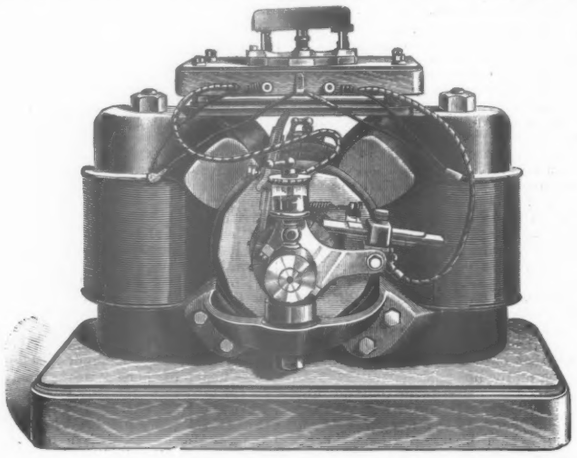
* * The Thomson-Houston Electric Railway Company has closed negotiations with the Troy and Lansingburgh people for an electric railway from the Troy city line to Lansingburgh and from Lansingburgh to Waterford. The franchise and license have already been secured from the trustees of Lansingburgh.

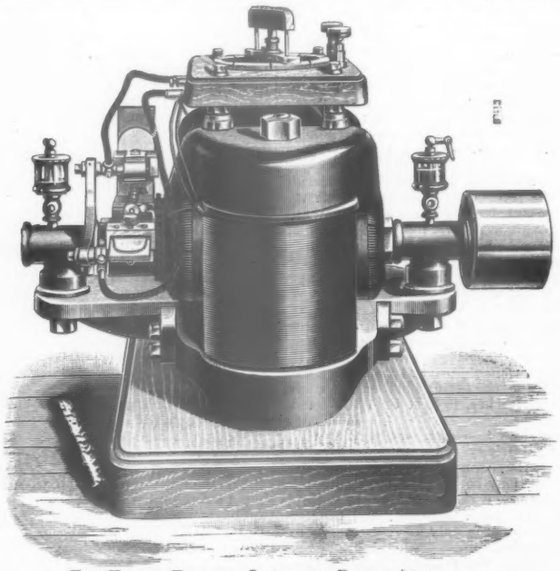
* * The Decatur (Ill.) Electric Company has commenced laying two miles of street railway track and will put in a plant to cost $100,000. Detroit and Louisville capitalists, it is said, are furnishing the money. The Citizens' Company, operated by Decatur capital, will run their street cars by electricity by July 4th.

* * Another of these contracts is with the Wilkesbarre and West Side Railroad of Wilkesbarre, Pa. It will be remembered that the Wilkesbarre and Suburban Railway was one of the first to equip with electricity, and since this road has been put into operation its success has been so great that its management have ordered additional number of cars.

* * We understand from the Sprague Company that they have closed contracts during the past week with the Lindell Avenue Street Railway Company, of St. Louis, Mo. This contract calls for 10 cars of 30 h. p. each, to be operated over five miles of track. The overhead system will be used and the line covers some of the most needed and principal streets of that city. The contract of this company with the Sprague Company calls for a complete equipment, including dynamos and full station equipment.

* * The city of St. Joseph, Mo., was one of the first to adopt electricity upon its street railroads for motive power, and on its Union Passenger Railway demonstrated the manifold advantages of electric power for propelling street cars. After this railroad had been running some time, another railway in this city, the Wyatt Park line, installed a complete equipment of electric cars, which have now been running about six months. The success of these two lines has been striking. They have become very popular with the citizens of St. Joseph on account of their speed, reliability and ease with which they are kept under control, and land in the vicinity of these roads has greatly increased in value, owing to their good service. There only remained two other railways in St. Joseph which had not yet adopted electric power, and these two railway companies, through their presidents, during the last week, have contracted with the Sprague Electric Railway and Motor Company, which furnished the equipments for the other two St. Joseph roads for the entire equipment of their lines. This last order amounts to 20 cars over 10 miles of track. Since the Union Passenger and Wyatt Park lines have been in operation, they have been so extensively patronized that each of these companies have ordered additional equipments of five and nine cars respectively. These orders now make 44 electric cars which are now in operation or have been ordered for the City of St. Joseph alone, with nearly 25 miles of track.





THE KESTER ELECTRIC LIGHT AND POWER APPARATUS.

The Kester Dynamos and Motors.

The Kester Electric Company, named after its inventor and electrician, is located at Terre Haute, Ind., and the machines manufactured by the company have some peculiarities which it is claimed do not pertain to any other form of motor or dynamo. It is for these reasons—the novelties and advantages claimed—that the REVIEW lays the Kester apparatus before its readers.

Mr. J. F. Kester, the inventor, who is also the superintendent as well as electrician of the company, has devoted his attention to the dynamo-electric question for many years, striving to produce an armature which would not burn. In the machine illustrated herewith, he feels that he has accomplished this desirable result. The machine is a four pole, open coil machine, and the only one on the market possessing the faculty of running without continually flashing or sparking at the brushes. It is absolutely a non-sparking machine. By short circuiting opposite commutator bars, but two brushes are required, and these are placed at an angle of 90 degrees. A novel and ingenious brush spring insures equal tension upon the brushes. The constant potential motor is shunt-wound and thoroughly self-regulating. The speed of the constant current motors is governed by a novel regulator—a modified form of ball governor, which closes the circuit of a determined number of armature coils through a resistance which is embodied in the armature itself. The entire regulating apparatus for a five horse-power motor weighs less than three ounces.

While somewhat resembling the Siemens drum armature in shape, the Kester armature differs from it as much as the Siemens differs from the Gramme, the Brush or any other form of armature.

The necessity for a heavy current for short time, which is always the accompaniment of starting machinery, is a severe test of the armature, and the burning out of that portion of the machine is not infrequent, while the same unfortunate result may befall a dynamo which is accidentally short-circuited on the line, because of the sudden increase of current. But the Kester armatures have in a number of instances been brought to a dead standstill by overloading, with no other damage resulting except an increase of heat below what would be dangerous to the armature, which was in every case uninjured. The company claims that it has never lost an armature by overheating.

The coils in a neutral position are automatically taken out of the circuit. The resistance of the armature is over 700 times less than that of the shunt. The commercial efficiency of dynamo is 90 per cent., and thirteen 16 candle-power lamps are guaranteed to the horse-power applied to the dynamo pulley.

The motor, even as small as three horse-power, is claimed to have an efficiency of over 90 per cent., and to regulate its speed within two per cent.

Up to the present time the Kester Company has confined itself to the incandescent lighting and power field, but has in contemplation an advance into the broader domain of street railway.

While some of the statements above seem at first startling, they are all guaranteed by the inventor, and by the company which is pushing the machines bearing his name.

* * In the coming of summer is heralded by the large number of street railways which have decided to adopt electricity upon their roads. During the Centennial week that has just past, a number of railway companies have signed contracts for complete electrical equipments, and it is interesting to note that among these is one of the largest and most important street railways in the important city of St. Louis, Mo.

* * A number of wealthy property owners of Long Branch have prepared a petition which will be presented to the Town Commissioners and the Board of Freeholders, asking permission to construct and operate an electric railway from West End to Pleasure Bay and through the town. Among others interested are R. Percy Dobbins, Philadelphia; D. M. Hildreth, proprietor of the West End Hotel; United States Senator Rufus Blodgett, Granville P. Hawes and G. M. Rollin. The road will be incorporated with a capital of $100,000, and be known as the Long Branch Electric Railway Company.

* * The Thomson-Houston Electric Company, Boston, report the following sales of stationary motors: 7.5 h. p., Walker & Pratt Manufacturing Co., Boston; 1 h. p., J. H. Kelly, Providence, R. I.; 10 h. p., Georgia Electric Light Co., Atlanta, Ga.; 10 h. p., Master Builders Association, Boston; 1 h. p., A. Harris, Providence; 1.5 h. p., Bonschur & Holmes, Philadelphia; 3 h. p., H. W. Ladd, Providence; 1.5 h. p., W. Shedley, Providence; 10 h. p., J. J. Hillman, Boston; 15 h. p., Garfield & Proctor Coal Co., Boston; 1 h. p., Cambridge Shirt Co., Cambridgeport, Mass.; 1.5 h. p., A. C. Manchester, Providence; 1.5 h. p., New Bedford Gas Co., New Bedford, Mass.; 3 h. p., C. F. Heptonstall, Providence; 1 h. p., B. F. Haley, Dover, N. H.; 1.5 h. p., John M. Sweeney, Wheeling, W. Va.; 3 h. p., E. L. P. Martin, Providence; 5 h. p., T. C. Entwistle, Lowell, Mass.; 15 h. p., Minot Estate, 39 Court street, Boston; 20 h. p., Whittier Machine Co., Boston, two motors for elevators; 5 h. p., Thomson-Houston Electric Light and Power Co., Buffalo, N. Y.; 10 h. p., Wales Manufacturing Co., Syracuse, N. Y.; 5 h. p., St. Catherines El. Ry. Co., St. Catherines, Ont.

Electric Lights in the Massachusetts General Hospital—A Model Plant.

In the installation of an electric lighting plant at the Massachusetts General Hospital in Boston, many exacting conditions had to be met on account of the relative position of the buildings, the location of the boilers and the character of the institution, which make the plant of more than ordinary interest. The buildings are scattered over a large area of territory, near the center of which is the boiler house. The plant as installed consists of two Westinghouse engines and two United States dynamos of unequal size furnishing current for 586 incandescent lamps, United States system. The difference in capacity of the dynamos affords means for most efficiently supplying current for the number of lamps in service.

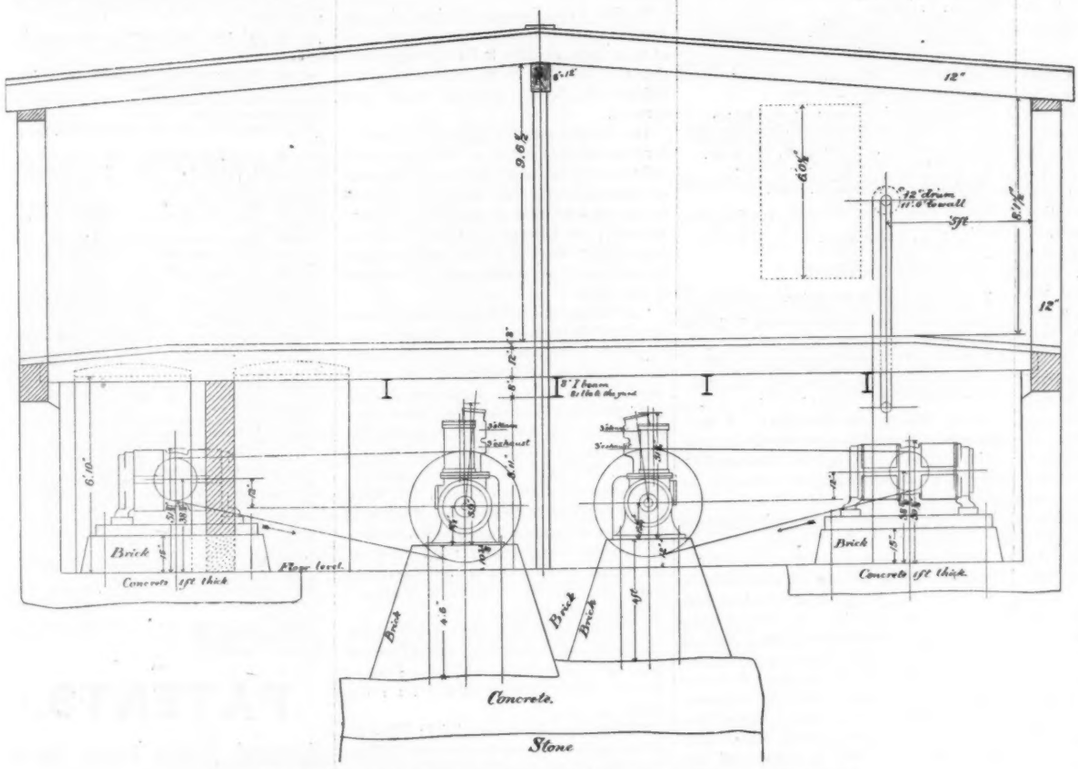
One of the conditions of the installation required is that the system should be entirely noiseless in its operation, and therefore it was necessary to have an exceedingly stable foundation under the engine, so that there should be no vibration. This firm foundation was furnished, although the cellar in which the station is placed is only two feet above high water mark and directly over the natural shore at a place formerly used for a dump, where on digging unstable material was found. On account of the building, piles could not be driven. The whole mass of artificial filling was dug through and down into the harbor mud until the clay was reached, when a large mass of stonework was built up and laid in cement for about 12 feet. Over this two feet of concrete was laid before placing the brick foundations for the engines. In this manner a firm bed was furnished entirely independent of any connection with the building, the result being that there is a steadiness to the foundation which prevents any jar at all, either directly to the engines or transmitted to the building. The dynamos are set upon brick foundations which are placed upon a bed of concrete one foot thick without any stone foundation beneath. The link belting being used, there is but very little noise from the operation of the apparatus, not enough to be heard outside of the building itself.

The method of heating the buildings is to generate the steam in the boilers at a pressure of 65 pounds to the inch, which is furnished to the circulation used for heating and cooking at a pressure of six pounds by means of a reducing valve. The exhaust steam from the engines in like manner enters the circulation the other side of the reducing valve, and when steam from the engines is not needed for this purpose it lifts a valve, and entering a pipe which reaches to the top of the chimney, passes away through an Aller exhaust nozzle. As the steam used for heating the buildings is led back to the boilers again after being condensed, it is desirable to remove the oil, and this is done by an oil extractor placed in the exhaust pipe near to the engine. The coal house was divided by a brick wall, forming a room at one side, and adequate storage of coal provided directly under a bridge constructed for the purpose. The coal is thrown directly into the bins by lifting trap doors in the bridge.

The whole work was designed by and installed under the supervision of Mr. C. H. J. Woodbury, C. E., consulting engineer of the hospital, and can be taken as a model installation of the kind. A view of the elevation is given, and will interest every practical electric light man.

The hygienic effects of this installation are of the most satisfactory nature. There has never been any gas in the wards on account of possible disturbance to the inmates, but at the present time every portion of the establishment is lighted by incandescent lamps, and by means of flexible conductors and netting protection two incandescent lamps can be placed in nearly every bed in the hospital, a matter of great importance in surgical cases.

John M. Pratt, M. D., the resident physician of the hospital, assigned the position of the lamps.



PLAN VIEW OF ELECTRIC LIGHT PLANT IN MASSACHUSETTS GENERAL HOSPITAL.

Electric Lighting by the Westinghouse Company.

During the latter half of April the Westinghouse Electric Company received orders for alternating current outfits as follows: Jonesborough, Ark., 750 lights; Westerly, R. I., 500 lights; Newark, N. J., 750 lights; Ottawa, Kas., 750 lights; Ashland, N. H., 500 lights; Minneapolis, Minn., 600 lights (increase); Auburn, Me., 750 lights; Traverse City, Mich., 500 lights. The total of orders for the month of April aggregate 15,850 sixteen candle-power lamps capacity. Total four months to April 30th, 74,000 sixteen candle-power lamps capacity. About one-third of the central station companies using the Westinghouse system have increased their capacity since starting, in most cases at least doubling their original outfit.

The Electric Club.

It is the intention of the newly-elected management of the Club to make the ensuing year one of great interest and value to all the members. The increase in dues will enable the Board to provide an increased number of the Club meetings which have been so instructive and entertaining in the past, and we are sure the slight advance in the expense of belonging to this progressive organization will be fully paid back to the members. The Club will be worth more to its members, we predict, during the ensuing year than ever before—the natural result of the advance that is being made all along the line of electrical endeavor.

The next lecture—the first since the annual meeting—will be delivered by that able financier and large owner of electrical interests, Mr. Erastus Wiman, who will be greeted by a very large electrical audience.

At the last meeting of the Board, in addition to electing new members of the Club, a house committee consisting of Mr. H. L. Storke, Gen. C. H. Barney and Mr. Geo. B. Coggeshall was elected—an admirable choice indeed. These gentlemen have the best interests of the Club at heart, and we predict that the details of the Club House management will be most acceptably looked after by them.

The great number of electrical people visiting the Paris Exposition this year has made the opening of Electric Club headquarters there very desirable, and as soon as the Exposition is in good running order, which will be about May 20th, the headquarters will be opened. This will be a meeting point for all electrical workers from the United States, and mail may be directed in care of the club headquarters. An attendant will be in charge speaking both French and English.

ELECTRIC LIGHT NEWS

—— An electric light company has been formed at Fernandina, Fla.

—— Consolidation seems to be the order of the day among gas companies.

—— The electric lights were lighted in Topsham, Me., for the first time Tuesday night.

—— Somerville, Mass., has appointed a committee to look into the advisability of adopting municipal lighting.

—— A car to hold a portable electric light plant is being built at Chambersburg, Pa., for the Cumberland Valley Railroad.

—— Foundations for the dynamos at the Elm street station of the Biddeford, Me., Electric Light Company have already been laid.

—— The directors of the electric light company at Greenfield, Mass., have declared another quarterly dividend of 1¼ per cent., payable May 10.

—— Ann Arbor, Michigan, is asking bids for lighting the city for three years, and the company now operating there will have a lively fight to hold the field.

—— The electrical display at the St. Louis Exposition this fall promises to be very large and interesting. St. Louis never does anything of this nature by halves.

—— The Americus Gas Light Company of Americus, Ga., have increased their capital stock from $40,000 to $60,000, and changed name to the Americus Light and Power Company. They will shortly add an electric plant.

—— The total damage done by fire in the Harlem Electric Lighting Company's old shops, New York, was about $150,000. Most of the machinery, dynamos, etc., were still in the building but packed and ready for removal to the new shops down town.

—— The Brush Electric Light Co., of Greeneville, S. C., has now 120 arc lights and 438 incandescent burning. Mr. A. D. Spear and Mr. E. Franklin, both thorough practical electric light men, are entitled to some credit for the good management and excellent shape this company finds itself.

—— The Mercantile Committee of the Massachusetts Senate has reported a bill incorporating Phœbus H. Alexander, Henry B. Cram, Robert Amory, Frank Ridlon, George W. Davenport, Warren S. Hill, their associates and successors, as the New England Electric Exchange, with power to hold $100,000 in real and personal estate.

—— Mr. Geo. W. Silsby has just closed contract for an Edison central station at Hackensack, N. J., consisting of 200 thirty candle-power municipal lights and 750 sixteen candle-power domestic lights. From this station it is proposed to light Englewood, three miles away, by means of the new Edison motor dynamo. This will be the first installation of the kind.

—— The stock of the Moorestown, N. J., Electric Light, Heat and Power Company is being rapidly taken up, and the future of the company seems assured. The stock would have been exhausted long since but for the limitations put upon the subscriptions. But 20 shares may be subscribed by one person, and the subscriber must be a resident of the town or a property holder.

—— The local scribe of the Oakland, Me., *Observer* puts pen to paper with the following result:

"Electric lights will soon be put in Otis' Hall, now used exclusively by Oakland Lodge, 21, A. O. U. W. The electric light is unsurpassing in popularity. If by accident a family is deprived of their light for a night or for an hour, the verdict is unanimous that kerosene does not fill the bill."

For some years we have had a vague sort of an idea that electric illumination was a little in advance of the mellow light of a kerosene lamp, and the opinion is now vindicated most emphatically. The Maine newspaper man goes still further in the statement the electric light is "unsurpassing in popularity."

KINDRED INTERESTS

MANUFACTURING NOTES.

Pond Engineering Company.—This enterprising company has opened an office at 51 Home Insurance building, Chicago, Ill.

The Western Electric Company.—The new incandescent system of this company is described and illustrated in a recently issued pamphlet.

Ansonia Brass and Copper Company.—Mr. Gilbert M. Smith, western manager of the Ansonia Brass and Copper Company, has removed the western establishment at Chicago from 64 Washington street to 133 and 135 Wabash avenue, the former locality having become altogether too cramped for the growing demands of the business. The A. B. & C. is carrying a very large stock of insulated wire, and able to fill any order without delay for that necessity of the second century of the Union.

The Empire City Electric Company, with their characteristic enterprise, illustrated their patriotic zeal during the "Centennial" days by electrically illustrating in both of their large show windows, the vast difference between the methods of illumination in vogue a century ago and now, by means of large tallow "dips" or candles and 75 candle power incandescent lamps, the figures 1789 being shown in one and 1889 in the other. Their entire building at No. 15 Dey street was beautifully draped and decorated, all by the direction and superintendence of their genial manager, Mr. H. G. Madden.

Brown & Sharpe Manufacturing Company.—This widely known manufacturing company, of Providence, R. I., has just issued a very instructive and thoroughly illustrated catalogue of 200 pages, which will be mailed free on application. In the manufacture of machinery, tools, and standard wire gauges and tools for accurate measurements, this company has a reputation of which it may well be proud, and is the result of most careful, intelligent and reliable workmanship. The catalogue just issued is one of the most complete of its kind we ever saw, and will be in great demand as soon as the fact that it has been issued becomes known.

The Commercial Electric Company, of Detroit.—Mr. Geo. E. Fisher, until recently manager of the Electrical Accumulator Company, of Detroit, Mich., and Mr. W. H. Fitzgerald, formerly general superintendent and manager of the Brush Electric Illuminating Company, of Detroit, have resigned their respective positions for the purpose of organizing the Commercial Electric Company, of Detroit, with headquarters at the central and desirable location of 53 and 55 Gratiot avenue, Detroit. A large store will be opened May 10th, the business of the company being dealing in general electrical supplies and electrical engineering and construction. Mr. Fitzgerald has been connected with the Brush company, both parent and local, for over 10 years, and Mr. Fisher with the Accumulator Company at Detroit, from the date of organization, up to the present time. Both gentlemen are enterprising, experienced and capable and will make a strong team. The REVIEW wishes them the fullest success.

The Sprague Electric Motor Company.—Messrs. Chadbourne, Hazelton & Company, Philadelphia representatives of the Sprague Electric Railway and Motor Company, of New York, have just added another street railway equipment to the long list which the Sprague Company have contracted for. They closed under date of April 30th a contract with the Wilkesbarre and West Side Railway Company, of Wilkesbarre, Pa., for the electrical equipment of their line. This contract calls for the equipping of 8½ miles of track with the Sprague overhead system. The company will start with three closed cars, each equipped with two of the latest improved Sprague 15 h. p. motors. Each of these cars will haul an open car, and the maximum speed of 15 miles and hour is guaranteed. The company will operate these cars from their own station, which will be equipped with a dynamo of 80,000 watts capacity. It is the intention of the company to increase this plant at an early date. The rail will be a 52 lb. Johnson girder rail, and the entire equipment will be first class in every detail.

The Thomson-Houston Electric Company, Boston, report the following recent sales of arc and incandescent lamps:

Adams, Mass., 45 arc.
Sanford Woolen Mills, Medway, Mass., 100 incan.
Monroe County Insane Asylum, Rochester, N. Y., 600 inc.
Saxon Woolen Mills, Franklin, Mass., 200 inc.
New England Co., Bath, Me., 300 inc.
Buffalo, N. Y., 100 arc.
Lowell, Mass., 1,000 alt.
Leominster, Mass., 50 arc, 600 alt.
Leicester, Mass., 600 alt.
Hudson, N. Y., 45 arc.
Portland, Me., 45 arc.
Manchester, N. H., 100 arc.
Revere, Mass., 600 alt.
Findley, O., 1,000 alt.
Woonsocket, R. I., 1,000 alt.
Pitman, Mass., 500 alt., 50 arc.
Rockland, Me., 30 arc.
Savannah, Ga., 250 arc.
Malden, Mass., 500 alt.
Upper Sandusky, O., 60 arc.
Columbus, Ga., 1,000 alt., 100 arc.
Thomasville, Ga., 50 arc.
Perry Paine Building, Cleveland, O., 1,000 inc.
Falls City Jean and Woolen Mill, Louisville, Ky., 200 inc.
Stearn & Silverman, Wheeling, W. Va., 20 arc.
Mowry Building, Syracuse, N. Y., 200 inc.
New Haven, Conn., 45 arc.
Washington Court House, O., 50 arc.
Cambridge, Mass., 1,000 alt.
Hudson River State Hospital, Poughkeepsie, N. Y., 800 inc.
Bedford, Pa., 50 arc., 600 alt.
Stamford, Conn., 1,500 alt.
Fernandina, Fla., 50 arc.
New Decatur, Ala., 50 arc.
Chester, Pa., 30 arc.
H. W. Smith, Bangor, Me., 50 inc.
T. J. Stewart, Milo, Me., 50 inc.
Riverside & Oswego Mills, Providence, R. I., 400 inc.
Morse & Wyte, Cambridge, Mass., 300 inc.
Jewell Milling Company, Brooklyn, N. Y., 200 inc.
James Walker & Co., Basin Mill, Mo., 50 inc.
Fort Paine Coal & Iron Co., Fort Paine, Ala., 400 inc.
J. B. Mason, Providence, R. I., 50 inc.

The Thomson-Houston Company have been obliged to greatly increase their facilities in order to handle their rapidly increasing business in electric railways. In addition to the large contracts which they closed some time ago, they have lately closed the following:

Lynn and Boston Railroad Company, Nahant line. This line has 4,369 feet of track, two turnouts, maximum gradient of four per cent. The line will extend from Central Square, Lynn, to Nahant House, Nahant. One car will be put in operation at first, the power for which will be obtained from the station of the Lynn Electric Light Company.

Newburyport and Amesbury Horse Railway Company, Newburyport, Mass. This line is about six miles in length, and will operate two cars. It is made up almost entirely of curves and grades, the maximum of which is 10 per cent. The cars will be operated by a current from the Newburyport Electric Light Company, Newburyport, Mass., and also the Amesbury Electric Light Company, Amesbury, Mass.

The Newton Circuit Line, Newton, Mass. This line will operate 10 cars and is eight miles in length, maximum gradient of five per cent. It will run from Newton to Watertown on the West End track, and on new track from Watertown to West Newton and Newtonville.

The Plymouth and Kingston Railway Company, Plymouth, Mass. This line is four miles in length and will operate three cars. The maximum gradient is six per cent. The line will run from Chiltonville through Plymouth to Kingston. On nearly all of the line the bracket method will be used. The track is about laid.

The Quincy Street Railway, Quincy, Mass. This line will operate four cars and is five miles in length. It extends from Quincy through Wellaston Heights and Atlantic to the Neponset River. The bracket method of overhead construction will be used.

The company has also received orders for new cars from the Wheeling Railway Company, Wheeling, W. Va.; West End Street Railway Company, Boston, Mass.; Topeka Rapid Transit Company, Topeka, Kan.; Omaha and Council Bluffs Railway and Bridge Company, Omaha, Neb.; Lynn and Boston Street Railway Company, Lynn, Mass.

The company has also constructed a track of about one mile for the Hillside Coal Company at Scranton, Pa., on which a 40 horse-power mining locomotive is used. This is used for carrying coal, and is capable of hauling about 20 cars loaded with one ton each.

The Copper Situation as Reported May 4th.

The Boston *Herald*, of May 4th, has a three column cable despatch from Paris on the failure of the copper conference confirming despatches to that effect that have appeared within a day or two. The amount of copper held for money advanced to the syndicate amounts to 175,000 tons, 150,000 of which is in Paris and the rest in London. The Paris holders of copper are the Bank of France, 60,000 tons; Rothchilds, 40,000 tons; Banque de Paris et des Pays Bas, 20,000 tons; Baron Hirsch, 20,000 tons, and the Credit Foncier, 10,000. Baring Bros. are the largest English holders.

The Rio Tinto Company insisted that the American mines should send only 20 per cent. of their surplus copper to Europe, a proposition that Col. Livermore, representing the Calumet & Hecla Company, would not agree to.

The correspondent says: "The Conference has failed to arrive at any agreement, written or verbal, and it has broken up without fixing a price. The American Committee has left Paris in disgust, and its members will sail from Liverpool for New York today on the "Servia." Copper will hereafter be put on the open market and sold for what it will bring.

"At the meetings of the conference, which were held daily three or four times a day, 16 gentlemen were present. First the American Committee, consisting of Col. Livermore, Messrs. Haggin, Lewishon, Abbott, and Wheelock and then the Europeans, comprising, M. Secretan, representing the Societe des Metaux; M. Edmond Moreau and M. Michourt, the official liquidators; Baron Rotschild, Baron Hirsch, two directors of the Bank of France, one director of Banque de Paris et des Pays Bas; Mr. Doetsch, of London, manager of the Rio Tinto mine; Mr. Mason, of London, of the Mason and Barry mine, and Mr. Guthrie, of Tatcher & Guthrie, metal brokers.

"Finally, after days of profitless discussion and some plain talk, Col. Livermore drew up a proposition which the Bank of France directors recommended for acceptance.

"The proposition was in brief: That the selling price of copper be fixed at £45 per ton; that a committee be appointed to determine what proportion of the 175,000 tons now in hand shall be regularly placed on the market, and what proportion of the future product from American and English-owned mines, the mines agreeing to curtail their output accordingly, this agreement to bold for six months, at the end of which time it could be renewed if it proved satisfactory, the parties concerned to meet again and make what arrangements necessary. This was accepted and ordered to be engrossed for signatures.

"The Frenchmen desired that when engrossed the document be sent to the Barings in London to secure the English signatures. This was agreed to and the meetings dissolved, everybody supposing, at any rate the Americans, the matter settled.

"The American committee returned to London to await the arrival of the engrossed agreement. They waited, but the document did not arrive.

"Mr. Doetsch of the Rio Tinto had refused to sign, and the Frenchmen refused their signatures if Doetsch held off, which he did on various pretexts."

The Thomson-Houston Company has received an order from the East Harrisburg Passenger Railway for one double motor truck equipped with two 15 h. p. motors.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING APRIL 30, 1889.

402,117 Universal upward-pressure contact-arm; Charles J. Van Depoele, Lynn, Mass.

402,120 Message and time recorder; John C. Wilson, Boston, Mass.

402,121 Telephone; Edward A. Woelk, Belleville, Ills.

402,165 Bell; Isaac Kinsey, Cincinnati, Ohio, assignor to the Standard Electrical Works, same place.

402,166 Galvanic battery; William P. Kookogey, Brooklyn, N. Y., assignor to the Kookogey Electric Company.

402,190 Distribution of electricity by secondary batteries; George B. Prescott, Jr., Newark, N. J., assignor to the Electrical Accumulator Company, of New York.

402,191 System of distribution by secondary batteries; George B. Prescott, Jr., Newark, N. J., assignor to the Electrical Accumulator Company, of New York.

402,192 Distribution of electricity by secondary batteries; George B. Prescott, Jr., Newark, N. J., assignor to the Electrical Accumulator Company, of New York.

402,200 Pole piece for dynamo-electric machines; John G. Statter, London, County of Middlesex, England.

402,249 Electric cut-out; James L. Kimball and Herbert C. Wirt, Boston, Mass.

402,264 Multiple switchboard; Charles E. McCluer, Richmond, Va.

402,290 Electric motor; Frederick Yeiser, Tampa, Fla.

402,298 Combined telephone and telegraph system; William Burnley, North East, assignor of two-thirds to Charles A. Hitchcock and Samuel A. Davenport, Erie, Pa.

402,311 Electro-locomotive engine; Sebastian Ziani De Ferranti, Hampstead, County of Middlesex, England.

402,329 Electric striking and repeating clock; Alphonse M. J. Jansen and Vincent J. A. M. Jansen, San Willibrordo, Curacoa.

402,332 Electrical gas lighter; Daniel C. Knowlton, Boston, Mass.

402,347 Thermometric indicator; William R. Patterson, Chicago, Ill., assignor to the Western Electric Company, same place.

402,349 Distribution of electricity by secondary batteries; Matthias Phatischer, New York, N. Y., assignor to the Electrical Accumulator Company, of New York.

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402,420 Insulating cut-out joint; Harry M. Doubleday and Russell Doubleday, Pittsburgh, Pa.

402,481 Incandescent lamp socket; Frederick C. Rockwell, Hartford, Conn.

402,484 Containing cell for secondary batteries; Paul Schoop, Zurich, Switzerland.

402,506 Electric signal; John T. Carter, Baltimore, Md., assignor of one-half to Frank J. Hilbert, same place.

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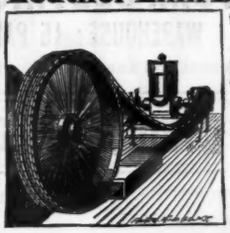

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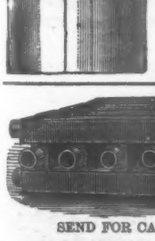

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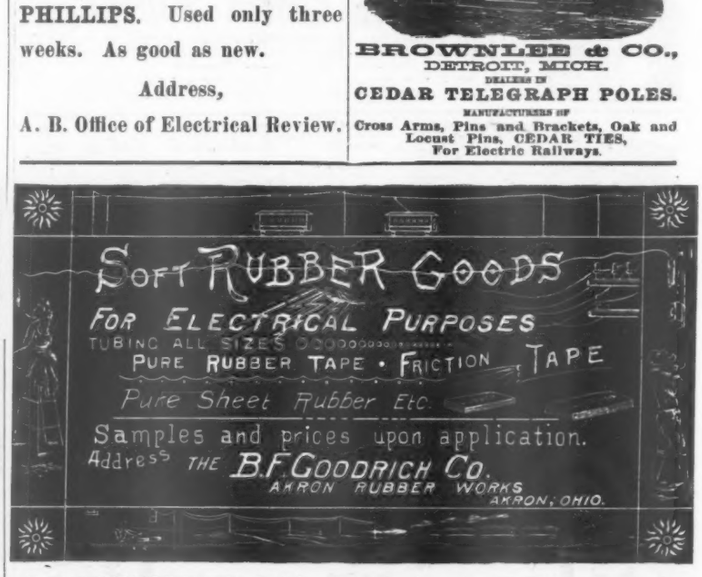

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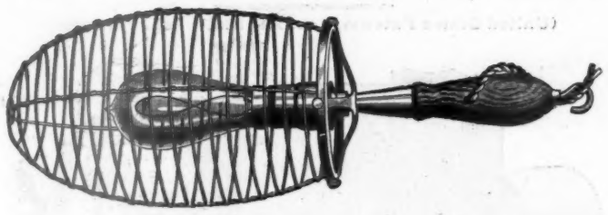

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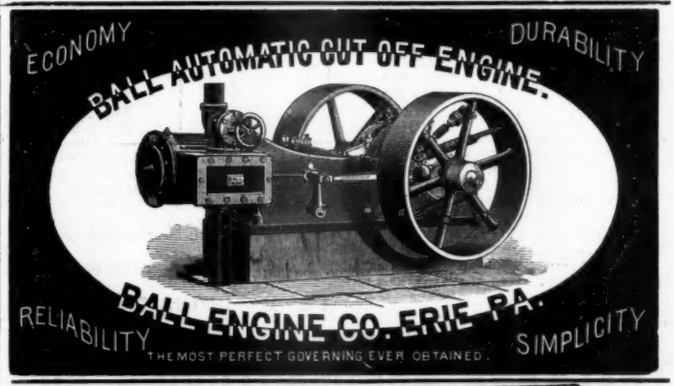

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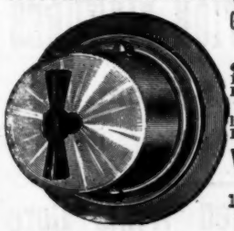

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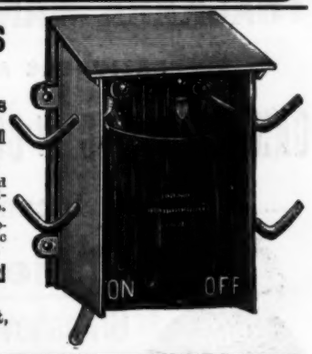

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Capacity in Microfarads per Knot.	Insulation Resistance in Megohms per Knot.	Temperature Centigrade, Degrees.	DATE.
.453	11240	8.5	Dec. 17
.441	9558	13.3	Dec. 18
.456	10080	13.0	Dec. 19
.441	10183	11.0	Dec. 20
.450	9620	10.8	Dec. 21
.450	10000	12.0	Dec. 27

Direct deflection 7200 meghoms per knot at 12° C. on Dec. 27th. Conductivity was obtained by making a number of measurements of the diameter of the wire, and a determination of the resistance of the entire length of the sample at a definite temperature.

The conductivity was 98.5 per cent. that of pure copper as given by Matthiessen.

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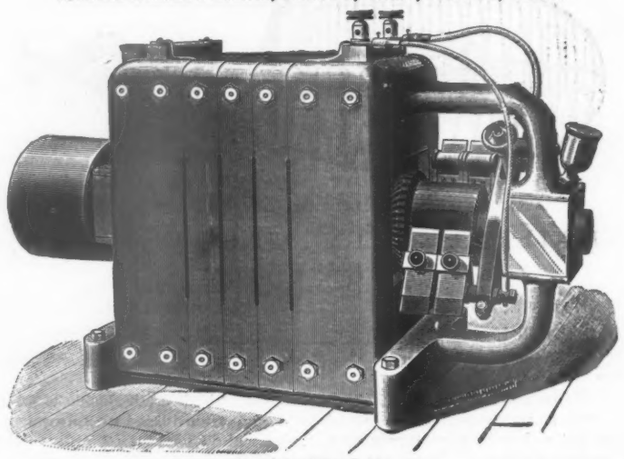

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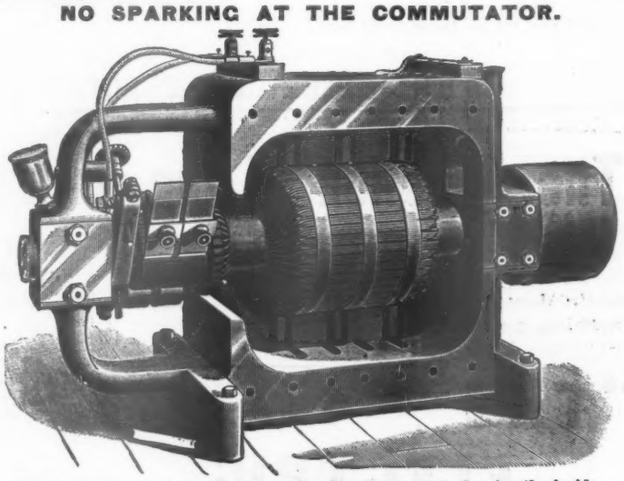

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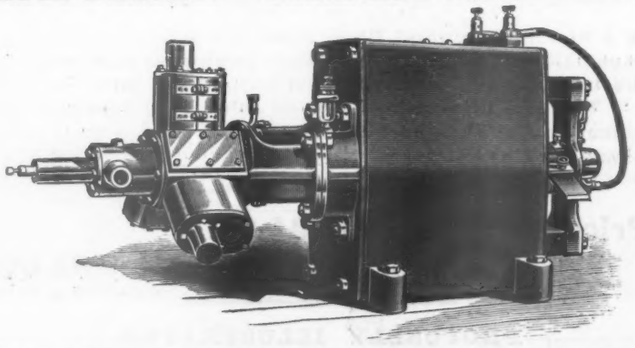

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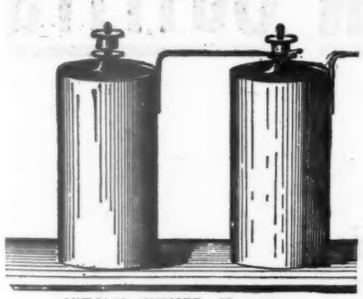

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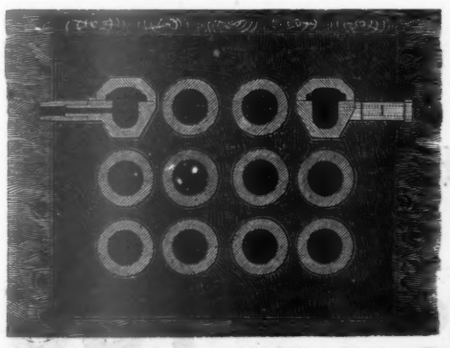

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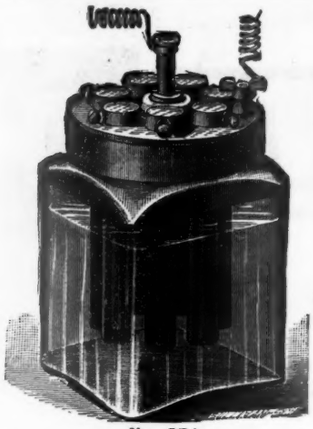

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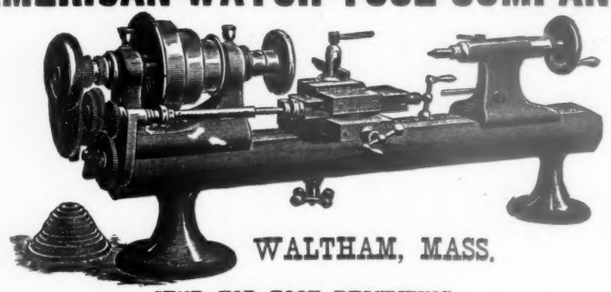

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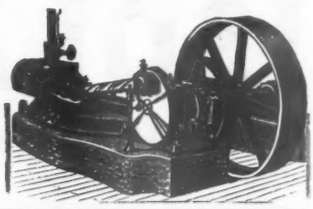

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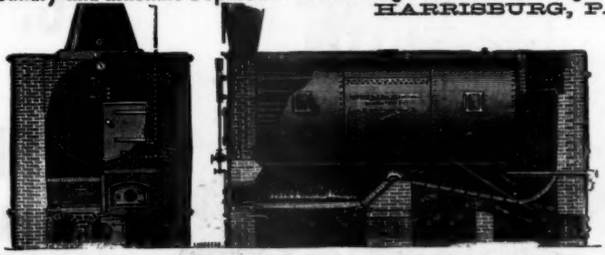

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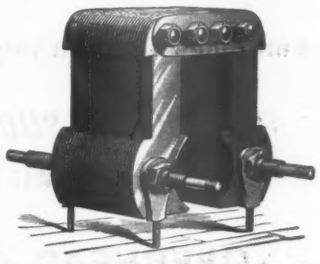

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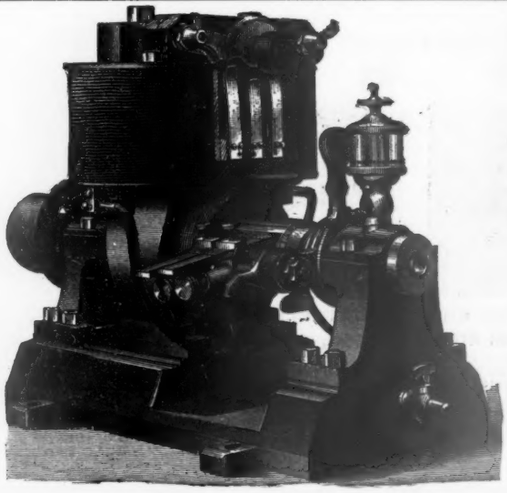

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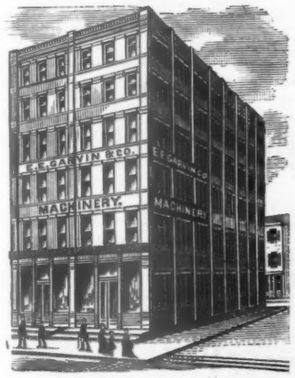

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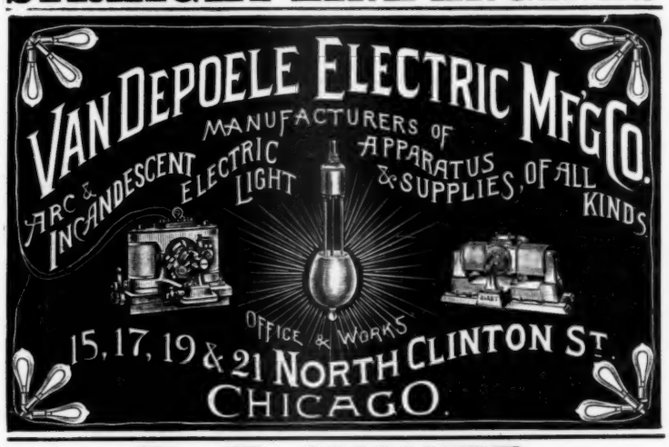
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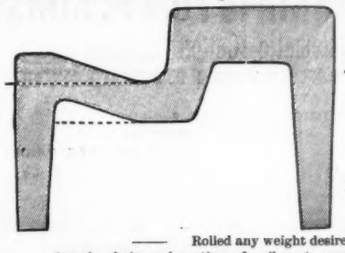

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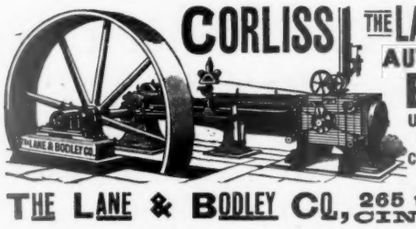

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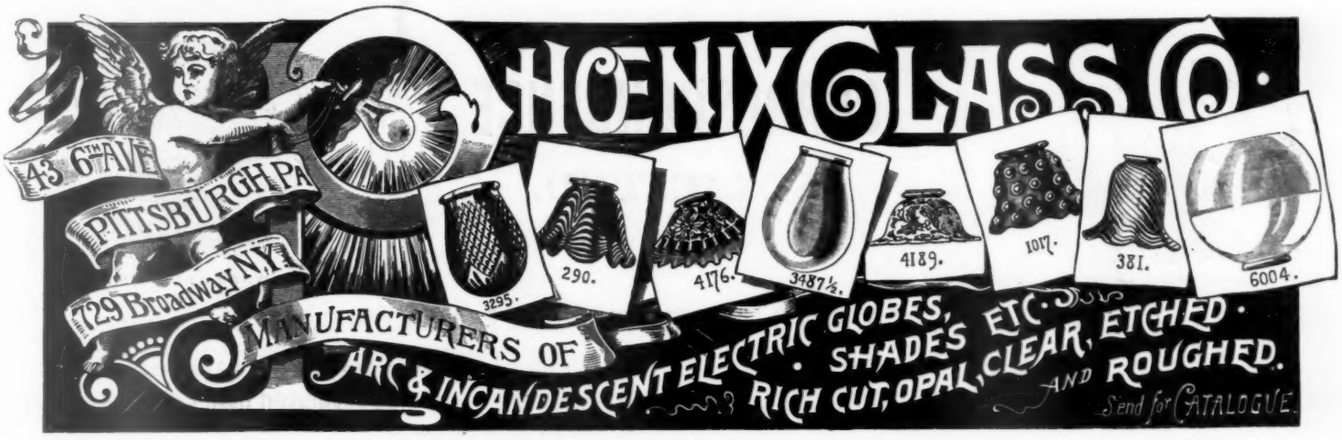

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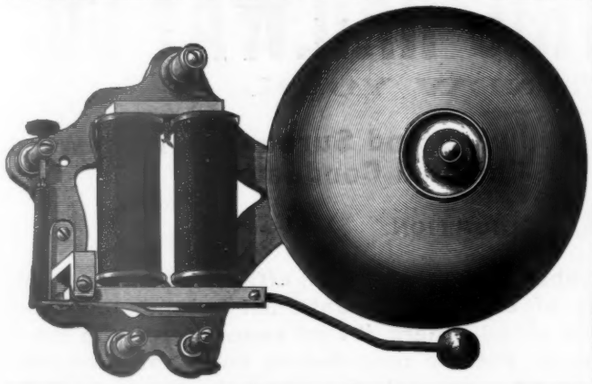

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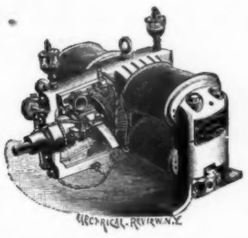

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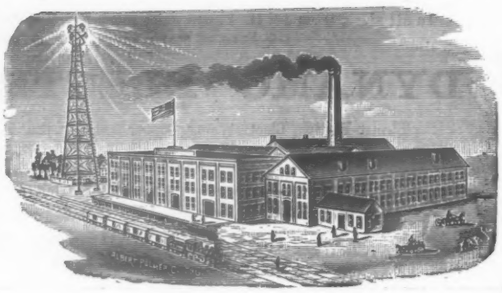

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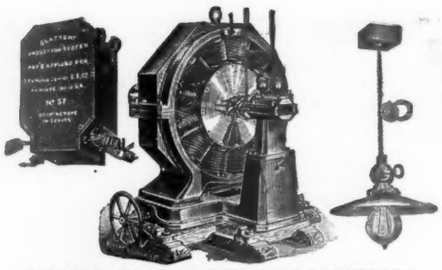

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